TROPICAL DISEASES BUREAU.

SANITATION SUPPLEMENTS

OF THE

TROPICAL DISEASES BULLETIN.

APPLIED HYGIENE IN THE TROPICS.

By Lt.-Colonel W. Wesley Clemesha, C.I.E., I.M.S. (retd.).

Supplement No. 1.] 1923. [March 31.

DISEASE PREVENTION.

Reece (Richard J.). **Port Sanitary Administration : Its Development and its Relation to Public Health in England and Wales.**—*Brit. Med. Jl.* 1922. Aug. 26. pp. 335–338.

The writer gives a very instructive account of the inception and growth of legislation directed to keeping communicable diseases out of a country when there is a danger of importation from ships and passengers conveyed on ships. The historical part is extremely interesting, but is unfortunately too long to review in detail.

From very early times reliance was placed on quarantine. The first attempt at this seems to have been in 1448, when the Venetians drew up a quarantine code with the object of keeping plague from their city.

In practically every case quarantine regulations have broken down, and nowadays the method of inspecting and noting the names and addresses of passengers is superior from the health point of view and does not, like quarantine, cause delay to ships. The writer also emphasizes the fact that wireless on board ship should considerably facilitate the proper carrying out of regulations at ports.

Bulletin de l'Office International d'Hygiène Publique. 1922. Aug. Vol. 14. No. 8. pp. 938–946.—**Organisation des services de protection de la santé publique en Algérie.**

Gives a complete survey of the sanitary personnel engaged in protecting the colony of Algeria from communicable disease, particularly that brought in by shipping.

The colony is divided into three main parts: Algeria, Oran and Constantine. In each there is a director and a suitable staff to carry out preventive measures, including a department entirely devoted to "deratization." Three-quarters of a million rats have been killed within the last 14 years, a very large amount of vaccination of immigrants has been carried out, and the usual preventive measures connected with plague, cholera and typhus have been undertaken.

(9040) Wt.P.5/115 1,500 4/23 Harrow G.75

Móra (António Damas). **O que devem ser as edificacões destinadas à Assistência médica, na Província de Angola.** [Improvements needed in the Medical Arrangements in the Province of Angola.]—*Rev. Méd. de Angola.* 1921. Nov. No. 2. pp. 197–208. With 6 figs.

The hospitals of the Province, except those of Loanda, Benguela, and, perhaps, Mossamedes and Lubango, are in a very primitive condition, and these four are by no means up to date. In each case the Governor of the District, feeling that a hospital was necessary, gave orders to the engineer, or the Public Works official, to erect one, the medical man not being consulted except in the choice of a site. Consequently they are defective in many ways, expensive and difficult to administer. Moreover, they were constructed some 40 years ago and subsequent modifications have rendered the management of them more rather than less cumbersome and difficult.

The author makes suggestions for the provision necessary in the districts say for the next ten years. He deals very briefly with the establishment of medical, surgical and administrative blocks, and the division of the former into accommodation for European and Non-European patients, and leaving room for further development.*

Bulletin International de la Protection de l'Enfance. 1922. July. No. 6. p. 463.—**La protection de l'enfance au Congo Belge.** [Summarized in *Bull. Office Internat. d'Hyg. Publique.* 1922. Oct. Vol. 14. No. 10. p. 1286.]

A Child Welfare League has been started in the Belgian Congo in order to give instruction for the avoidance of several undesirable practices of common occurrence. At every station where there is a doctor nurses are posted to manage dispensaries, where children are weighed and arrangements are made to supplement their diet with milk, and clothes and medicaments are given.

Gaide. **Considérations générales sur le fonctionnement de l'assistance médicale indigène et du service l'hygiène et de la prophylaxie en Annam de 1910 à 1920. Progrès réalisés pendant cette période.**—*Ann. de Méd. et de Pharm. Colon.* Paris. 1922. May–June–July–Aug. Vol. 20. No. 2. pp. 216–224.

The writer describes the progress in Annam of medical and hygienic work for the ten years, 1910 to 1920, giving a list of the various hospitals that have been founded in the time. In 1910 the number of patients was 7,200; in 1920 it was 30,000: the number of confinements in hospital was 325; it is now 3,466.

As regards general hygiene, local committees have been established and something corresponding to municipalities in the principal towns. Leper asylums and special hospitals for venereal disease have also been founded.

Smallpox has been very greatly reduced in the decade; under certain conditions of famine and flood, cholera still gives a great deal of trouble. Anticholera vaccine has been in use since 1916. Plague has occurred in several parts of the colony; the usual measures for combating it have been reasonably successful. Malaria naturally occupies a large field in a province of this kind; measures are being taken as far as possible.

---

* Summarized by Dr. H. H. Scott.

PETER (W. W.). **Present Health Conditions in China and their Relation to the Christian Church and its Future.**—18 pp. 1922. Council on Health Education, 4, Quinsan Gardens, Shanghai, China.

This little pamphlet shows that the missionaries in China are recognizing that it is more important to prevent disease than to cure the sick. They have formed a council to give a lead in health education in all missionary institutions, and they have recommended that health teaching be included in the curriculum of all their schools and normal schools, and in special summer schools for their teachers in large medical and educational centres. They also express the desirability of establishing a department of Preventive Medicine in their medical schools, and ultimately of special schools of Public Health.

PARREIRAS (Decio). **Sobre saneamento rural.** [Rural Sanitation.]—*Brazil Médico.* 1922. July 1. Year 36. Vol. 2. No. 26. pp. 6–10.

An account of the work of the Rockefeller Commission in the Parahyba and neighbouring districts of Brazil by Dr. Parreiras, who was the Sanitary Sub-Inspector for this area.

68,450 faecal examinations were carried out during four years (1918 to 1921 inclusive) and 76·93 per cent. were found infested with hookworm. Different groups of places were dealt with in successive years and the percentage of infection varied from 66·34 per cent. to 93·27. A list of the municipalities examined is given, and the least infected was found to be Guaxupé, in Minas Geraes (20·39 per cent.), the greatest being Torres, in Rio Grande do Sul (97·02 per cent.).

Ascaris lumbricoides ova were found in 88·11 per cent. of the whole, those of Trichuris in 63·80 per cent. Cestodes in 0·23 per cent. only.

Two doses of 1·5 cc. of oil of chenopodium led to the expulsion of 99 per cent. of the worms. Nearly 60 per cent. of those who received but one treatment appeared to be freed from their parasites.

Haemoglobin estimations showed an average reduction to 75 per cent. by the Talquist scale.*

SIMPSON (W. J.). **Preventive Aspects of Endemics in Modern Times.**—*Jl. Trop. Med. & Hyg.* 1922. Aug. 15. Vol. 25. No. 16. pp. 257–260.

The first part of this article is historical and deals with the progress of the discovery of the cause and method of spread of most tropical diseases. This should be read by all interested in the subject. The conclusions based on this argument are in the author's own words :—

" (1) That there is sufficient known of the ordinary diseases in the tropics and their mode of prevention to justify the creation of a special sanitary service in each of the colonies by the nations to whom they belong in order to prevent and abolish these diseases.

" (2) That such a sanitary service is imperatively needed owing to the great wastage from preventable disease in the tropics, and is urgent because of the small population in each country and the necessity of preserving it.

" (3) That such a service can only be thoroughly effective when it is composed of a native agency fully trained and well supervised by highly trained experts.

---

* Summarized by Dr. H. H. SCOTT.

" (4) That the organization should include arrangements for (*a*) investigation and ordinary routine laboratory work, and for (*b*) research in the laboratory and the field on the more obscure endemic diseases.

" (5) That to facilitate research and preventive measures it would be of much advantage for comparison to have regularly included in the valuable statistical data furnished by the Office International d'Hygiène Publique and the American Public Health Administration similar information concerning (*a*) the epizootics in the countries concerned, such as plague, rinderpest, cattle plague, foot-and-mouth disease, anthrax, etc.; (*b*) the diseases affecting plants, grains and crops, and (*c*) any extraordinary appearance of insects and vermin, and of swarms of locusts, caterpillars, etc. All these, with the localities in which they occur, should be chronicled with the epidemics of man.

" (6) That an effort should be made to map out the more permanent endemic localities of influenza, smallpox, plague, cerebrospinal disease, trypanosomiasis and leprosy on similar lines to those employed by the Rockefeller Foundation in regard to yellow fever, and that these should be studied from every known point of view by special commissions, financed by voluntary associations."

To this there will be no dissentient. The only criticism we can offer on a paper of this nature is that the main difficulties in sanitary progress throughout the tropics are nowadays largely financial.

This we consider brings us to the next stage in the argument, namely, that the people themselves must pay for these improvements and this they will never do until they are educated up to demand them. All who have spent many years in the tropics know that it is not much use trying to establish a standard of sanitary excellence very much in advance of what the people themselves demand, particularly if they are to be asked to contribute to the cost.

EATON (W. E.). **Education the First Step in Public Health Administration among Peoples Practically Aboriginals.**—*Milit. Surgeon.* 1922. Nov. Vol. 51. No. 5. pp. 560–566.

The main contention of the writer is that education should precede attempts to enforce sanitation by law, the latter method being unsuited to primitive peoples. We entirely agree with this opinion, as would every other authority who has had to deal with a primitive race. The author, however, says very little as to the best lines of educating any particular race.

ASSAM. **Supplement to the Annual Public Health Report of the Province of Assam for the Year 1921. Antimalarial Work in Assam.** [YOUNG (T. C. McCombie), Director of Public Health.] —20 pp. With 2 folding charts. 1922. Shillong: Assam Secretariat Printing Office. [Price 11 annas (1*s.* 5*d.*).]

The writer describes two very satisfactory antimalarial campaigns in Assam.

One of these was undertaken at the railway junction station of Lumding, in the Nambor forest, where there is a railway population of about 3,000 who at certain times of the year suffered greatly from endemic malaria.

A careful survey showed great abundance of Anopheles, namely, *A. funestus*, *A. maculatus* and *A. fuliginosus*, which were carriers,

besides *A. barbirostris, A. sinensis, A. kochi, A. vagus,* and other species. *A. listoni* was plentiful in the kutcha drains.

The town was situated in a large clearing in the forest. There were two undrained swamps covered with grass and reeds, besides dhobi tanks. Along the eastern border was a tortuous stream with a sandy bed and deep banks.

It was decided to concentrate on the breeding places where the known carriers were prevalent. A surface drainage system was carried out and borrow pits were filled up.

By means of mud bunds the river was divided up into convenient lengths, which were successively treated with larvicide, beginning upstream and progressing downstream by opening the bunds. Ten and a half miles of pucca drain were also put in. As a result of all these measures the splenic index of the children within the last two years has been reduced from about 87 to 27 per cent. and the malaria as judged by the figures at the Charitable Dispensary has been reduced nearly 50 per cent. The total cost of the whole scheme was Rs.144,622.

The other scene of antimalarial operation was at Pasighat, on the extreme north-east frontier of Assam, where are stationed military police and a labour corps, over 51 per cent. of whom suffered from malaria. The settlement lies in a clearing about a mile long and 300 yards broad on the banks of the Dehong river, where it emerges from the Abor Hills; at its north end is a small tributary stream. As there is a sharp slope to the river drainage presented no difficulty.

After a year's careful survey of larvae and breeding places it was found that 95 out of 157 emergent mosquitoes were *Anopheles maculatus* and that these came from the tributary stream. The jungle between the stream and the settlement was cut down and the banks of the stream drained and ditched and regularly treated with larvicide. It was found impossible on the score of expense to put the stream entirely underground.

The result has been very great improvement in the health of the labour corps and police. The writer points out that the conditions in Pasighat appear very much to resemble those of the Federated Malay States, where *Anopheles maculatus* is one of the chief carriers of malaria.

PALESTINE. **Proceedings of the Fifth Meeting of the Antimalarial Advisory Commission, 8th June, 1921.** [HERON (G. W.), Director of Health, President.]—[M.S. received from Colonial Office.]

These Proceedings are always of great interest; unfortunately we are unable to do justice to them. It was reported that 1,149 pumps in connexion with household supplies of water had been provided in 1921 and 371 in the first quarter of the present year. Difficulty of price is gradually being overcome. We are particularly interested to know how these pumps work; in most parts of the tropics pumps are not satisfactory because when they get into disrepair there is no one to put them right. We would like to know how this difficulty is overcome in Palestine.

The following figures of malaria in the troops in Palestine are of interest:—

"In the year 1920 in a garrison of 20,000 men there were:—

531	primary and	274	recurrent	cases in British troops;
817	,,	500	,, ,,	Indian ,,
752	,,	54	,, ,,	Egyptian labourers;

i.e., an incidence of primary malaria of more than 10 per cent.

"In the year 1921 in a garrison of 12,000 men there were :—
176 primary and 186 recurrent cases in British troops;
56 ,, 145 ,, ,, Indian ,,
42 ,, 103 ,, ,, Egyptian labourers;
i.e., an incidence of primary malaria of less than 2·3 per cent.
"Up to the end of May during the present year there had been :—
4 primary and 39 recurrent cases in British troops;
0 ,, 9 ,, ,, Indian ,,
"In one of these primary cases the malaria was contracted in Egypt, and in the other cases the actual infection occurred during 1921."

The following report by Dr. KLIGLER is also worthy of publication.

"Dr. Kligler gave an account of experimental work undertaken by the Hadassah Medical Organization in Galilee to determine the cost of malarial control in places where permanent drainage on a large scale was not possible and where malarial incidence was high.

"In order to test the efficacy and cost of different methods of control four bad malaria areas (Migdal, Kinereth, Menachamia and Yemma) in Lower Galilee were chosen. All four places have a high malaria incidence as well as a high spleen and parasite index before the work was commenced; but the conditions and factor responsible for them varied.

"In general it might be said that the two chief factors responsible for the high malaria incidence were the bad irrigation system and the neglected, overgrown wadis. The natural swamps were small and of relatively little importance in comparison with the numerous breeding places caused by the poorly constructed overgrown irrigation canals and clogged wadis.

"In all places the work was started by a general examination of all inhabitants in order to detect the chronic cases of malaria, who were subjected to an intensive treatment of quinine along the lines suggested by ROSS in England and BASS in America.

"The control measures adopted in different places varied. Anti-mosquito measures were adopted in Migdal, Kinereth and Yemma, and not in Menachamia. In Migdal and Kinereth quinine prophylaxis was also distributed.

"The antimosquito measures consisted in (1) cleaning and repairing the irrigation canals and closing them for 36 to 48 hours every ten days; (2) regular thorough inspection and petrolization of all breeding areas; (3) drying stagnant pools, covering cisterns, etc.

"The results and cost are shown in the table below. In general, it may be said that the degree of control was the same as that obtained in America during the first year of work and the *per capita* cost only somewhat higher. The reason for the high cost is to be found in the high cost of materials."

TABLE I.

Malaria History of the Demonstration Areas.

Area.	Population Average.	Average Monthly Incidence before Control.	Spleen Index.	Parasite Index.
		per cent.		
Migdal Farm ..	71	8·9	26·0	2·5
Kinereth ..	319	9·4	12·0	6·0
Yemma ..	440	3·9	21·0	2·8
Menachamia ..	100	5·5	22·8	3·8

TABLE II.

Summary of Degree of Control and Costs in the Different Areas.

Area.	Character.	Average Population.	Measures Adopted.	Degree of Control.	*Per Capita* Cost.*
				per cent.	
Migdal ..	Farm and Camp.	345	Antimosquito	82	44 Pt.
Kinereth ..	Isolat. Sett.	409	Same as Migdal	85	59 ,,
Yemma ..	Colony ..	609†	Antimosquito only.	91	38 ,,
Menachamia	Colony ..	105	Prophylactic only.	85	35 ,,

* The average cost of antimosquito measures in Migdal, Kinereth and Yemma is $1·88, as against an average *per capita* cost of $1·31 in America.
† Including Arabs.

The commission after some discussion came to the opinion that the use of Chara foetida in Palestine could have a very limited application in view of the offensive scum it formed over the water, which would prevent any place in which it grew being used for watering animals.

HAWORTH (W. E.). [**Discovery of a New Breeding Place for Mosquitoes.**] [Correspondence.]—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1922. June 22. Vol. 16. No. 3. p. 201.

The author has observed in Dar-es-Salaam mosquito larvae in the tops of coconut palms. Between January and June of the present year 1,673 palms produced 1,549 collections of larvae, among which *Culex fatigans* and *Stegomyia fasciata* were predominant, but among other species *Anopheles costalis* were recognized.

[These results appear to be of very great importance to medical officers concerned with mosquito problems on coasts where coconut palms abound. In Dar-es-Salaam in dry weather it is possible entirely to rid the town of Anopheles, but not Culicines. In the rains, in spite of all endeavours, Anopheles were occasionally caught at the test stations; and the breeding places were suspected to be palm trees. It is now satisfactory to know that this suspicion has been definitely confirmed.]

LAMBORN (W. A.). **The Bionomics of Some Malayan Anophelines.**—*Bull. Entom. Res.* 1922. Aug. Vol. 13. Pt. 2. pp. 129–149. With 1 text fig.

Everyone knows the difficulties of breeding-up Anopheles larvae in the workroom. The author at last discovered that all the open-country species could be brought up easily in polluted water containing an almost pure culture of Euglena (probably *E. viridis*).

FLETCHER (T. Bainbrigge). **Traps for Mosquitoes.**—*Report of the Proceedings of the 4th Entomological Meeting held at Pusa on the 7th to 12th Feb., 1921.* pp. 219–221. With 1 plate.

The writer gives an account of a simple and efficient mosquito trap. Plans of this are given overleaf.

T. Bainbrigge FLETCHER.]

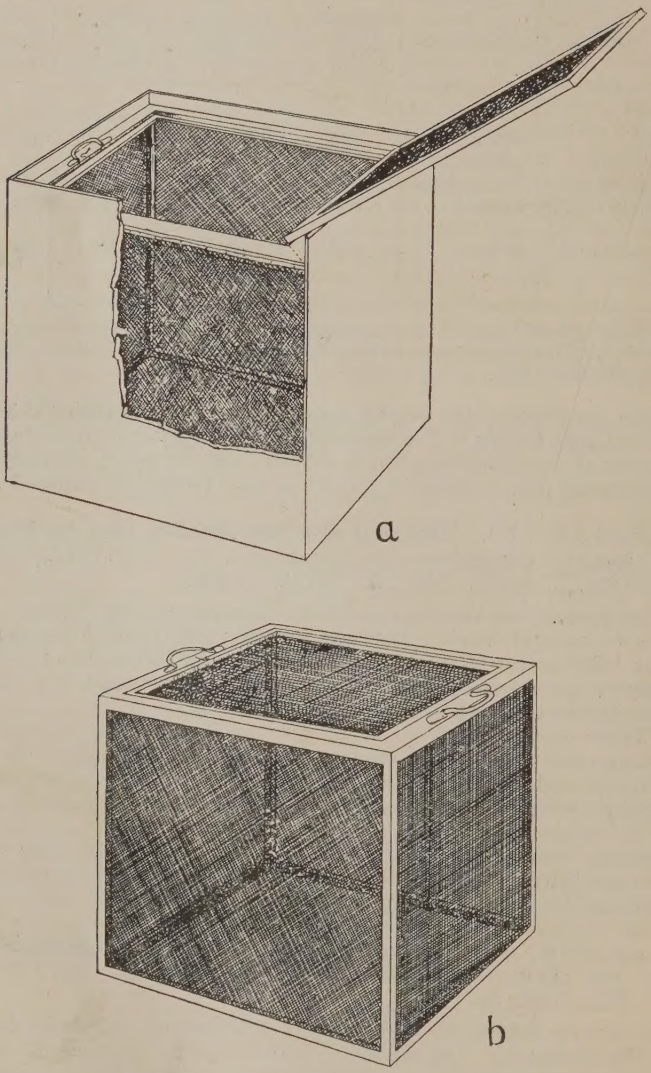


FIG. 1.—New mosquito trap: (*a*) open, and (*b*) closed and removed from outer case.

[Reproduced from *Report of Proceedings of the 4th Entomological Meeting, Pusa.*]

The ordinary box trap for mosquitoes suffers from the defect (1) that it is not possible to see what is in the box; (2) that it is necessary to use chloroform or benzine to kill the mosquitoes, and the smell of this persists in the box and repels the insects. The new design, which is free from these objections, " consists essentially of a wooden skeleton of a box with a hinged lid covered over on all sides with black mosquito netting. This skeleton box is contained inside an open-topped wooden box which is painted black on the inside. The whole is then placed in a suitable position over night and left with the hinged top of the inner box open. In the morning, when the mosquitoes have settled down, the hinged lid is closed and fastened with the metal hook fasteners and the inner box can then be lifted out by the handles provided for this purpose."

To kill the mosquitoes the inside gauze box is withdrawn and put in the sunlight; usually in a few minutes the mosquitoes are dead, and even in damp weather they do not survive many hours.

The writer recommends that the inside of the box should be black, unless further experiment should discover a colour more attractive.

BECKER (William L.). **Methods suggested for the Extermination of Mosquitoes.**— *Amer. Jl. Public Health.* 1922. June. Vol. 12. No. 6. pp. 509–513.

The author gives some interesting details of anti-larval measures in malaria, especially the oiling of sheets of water. He considers the best form of oil is " straight-run gas oil," a fuel oil ranging in gravity from 36 to 38 Baume and in viscosity from 34 to 38 drops per min. at 100° F. This type of oil does not cause explosion and is very difficult to ignite in bulk. It is unfortunate that the term " straight-run gas oil " is not explained. We are uncertain whether it is a crude or partially refined product.

The author recommends three kinds of apparatus for spraying this over the surface. The knapsack spray is satisfactory, but the oil nearly always drenches the operator. The compressed air spray he does not recommend, because the range is short and the stream weak. The cylinder pump spray is efficient, but heavy to carry about. About 1 gal. of the oil should be used on 150 sq. yards of surface, but much more may be required if vegetation is present.

In papers on this subject we notice that practically no American authors make use of Col. GORGAS's formula. Personally we have found this to be more satisfactory than crude oil for some tropical countries, and the emulsion is undoubtedly improved by the addition of 1–2 per cent. of castor oil.

GIVEN (D. H. C.). **The Campaign against Mosquitoes on Board H.M.S. *Cadmus* in April, May and June, 1912.**— *Jl. Roy. Nav. Med. Service.* 1922. Oct. Vol. 8. No. 4. pp. 265–269. With 1 text fig.

This article deals with mosquito prevention on H.M.S. *Cadmus* in Hankow, and pictures show the mosquito net as applied to the ordinary naval hammock. The writer says that though this type answered fairly well, nets require much more time and trouble to fix up than the average seaman is prepared to take, and that on a hot night they made sleep difficult because they cut off the air; they are very easily torn.

The writer uses largely citronella oil, rubbed on the ankles and face, and he considers that as a general rule it will keep mosquitoes away for a night. In the ship itself the burning of joss sticks and wire gauze over port-holes also effected considerable improvement.

The writer points out that the allowance made by the Admiralty of a piece of gauze 2 yards by 1 is utterly useless; at least 3 yards by 2 is required for a satisfactory net.

Fig. 2.—Type of mosquito net in use on H.M.S. *Cadmus* in 1912 (devised by the Medical Officer, Dr. H. C. Given).

[Reproduced by permission from the *Journal of the Royal Naval Medical Service.*]

Padwick (H. B.). **Some Notes on Early Attempts at Prophylaxis against "Coast-Fevers" on the West African Station.**—*Jl. Roy. Nav. Med. Service.* 1922. Apr. Vol. 8. No. 2. pp. 89–98. With 4 text figs.

This very interesting paper deals with times anterior to the discovery of the rôle of mosquitoes in spreading yellow fever and malaria.

The writer also gives plans of a suitable mosquito curtain for the ordinary naval hammock. These are given below.

"Fig. 1 shows the extent to which a length of 6 ft. covers a hammock, and figs. 2, 3, 4, the 9 ft. length as we applied it.

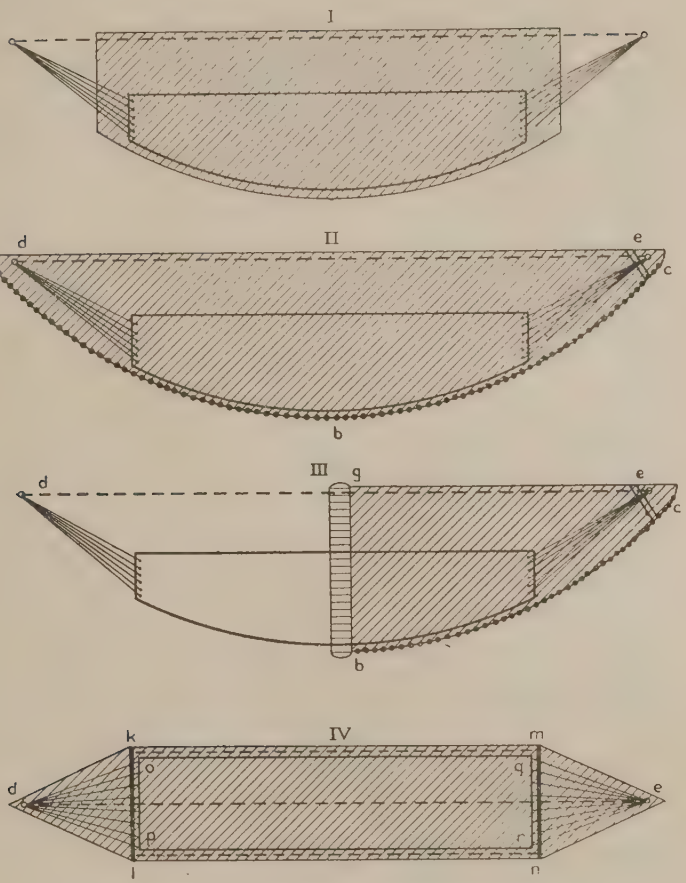


FIG. 3.—Diagram I shows extent to which the ordinary issue of 6 ft. of netting covers a hammock, and diagrams II, III and IV the 9 ft. length as applied on H.M.S. *Dwarf*.

The long edges of the netting (*a*, *b*, *c* in diagram II) are sewn together, making the net into the form of a tube which is passed round the hammock before it is slung, and suspended over the hammock lashing (*d*—*e*) which is passed from hook to hook. One end of the tube of netting is then closed by lashing it around the clew (*e*—*c*). The other open end is rolled back (diagram III, *g*—*b*) so that a man can get in. When in the hammock he rolls the net back over his head and closes it by means of a tape (*d*) which is threaded around it and, when drawn taut, turned up on one of the spreaders inside. Diagram IV shows the system of spreaders used to keep the net well away from the hammock and its occupant. Two spreaders (*k*—*l*, *m*—*n*) are on the hammock lashing and two on the clews of the hammock.

[Reproduced by permission from the *Journal of the Royal Naval Medical Service*.]

"The long edges of the netting issued (*a, b, c,* in Diagram II) are sewn together, making the net into the form of a tube, which is passed round the hammock before it is slung and suspended over the hammock lashing (*d—e*), which is passed from hook to hook.

"Open end of the tube is then closed by lashing it around the clew (*e—c*). The other open end is rolled back (Diagram III, *g—b*) so that the man can get in. Once in his hammock he rolls the net over his head and closes it at the clews by means of a tape (*d*), which is threaded around it and, when drawn taut, turned up on one of the spreaders inside.

"Diagram IV shows the system of spreaders used to keep the net well away from the hammock and the exposed limbs of the occupant.

"Two spreaders (*k—l, m—n*) are on the hammock lashing (*d—e*), and two on the clews of the hammock.

"It is rather an elaborate process to get in and out, but it does afford complete protection and the men soon got used to it."

MacArthur (W. P.). **Mosquito Netting.**—*Jl. Roy. Army Med. Corps.* 1923. Jan. Vol. 40. No. 1. pp. 1–11. With 7 figs.

This is one of the most useful papers that has been published for a long time. After a discussion, which necessarily goes to some length, of the factors concerned in the measurement of the mesh of mosquito netting, both wire gauze and cotton, for the comprehension of which the author watched the process of manufacture from start to finish, and a description of his experiences with laboratory-bred *S. fasciata*, the author reaches the following conclusions :—

"I believe that cotton netting of 25–26 holes to the square inch, and woven of 30/s or 40/60 cotton, will exclude mosquitoes when used as a mosquito curtain under natural conditions.

"As regards screen-cloth, I think that screen-cloth of 14 mesh to the inch and 30 I.S.W.G.* should suffice to exclude mosquitoes from buildings. As is well known, the eggs of *S. fasciata* can withstand drying for long periods, and they may subsequently be washed into tanks and other containers when rain comes. Such receptacles should be screened with 18 mesh gauze, as freshly emerged *S. fasciata* might struggle through a coarser mesh before their exoskeleton sets. Mosquitoes at this stage do not suck blood.

"If buildings are screened with unnecessarily fine screen-cloth no harm is done, for this material is more or less of a fixture and cannot be discarded at the will of the individual. Whereas there is grave

---

* "Obviously the size of the apertures depends not only on the number of holes per inch, but also on the gauge of the wire used. This is calculated in terms of an Imperial Standard which came into operation by Order of Council in March, 1884. In Imperial Standard Wire Gauge a descriptive number indicates the diameter of the wire. Thus '70/0' I.S.W.G. has a diameter of 0·5. inch. . . . We are mainly concerned with the gauge of wire round about '30' [=0·0124 inch.]

"Obviously the method of standardization according to diameter which is adopted for wire cannot be employed for material like cotton. This is graded according to weight, and in terms of the ratio of the accepted factor of 840 yards to 1 lb. Thus, '30/s' cotton means that such thread goes 30 times 840 yards to 1 lb. The cotton employed for mosquito nets usually varies from 16/s to 100/s. . . . Frequently nets are not woven of the same grade of cotton throughout, a thicker thread being used for the warp than for the bobbin. A very common combination for mosquito netting is 40/60, that is 40/s cotton in the warp, and 60/s in the bobbin."

objection to the use of cotton netting any finer than is absolutely necessary, as will be realized by medical officers who have experienced the difficulty of inducing troops to remain under their nets at night, especially in a hot steamy climate. The finer the mesh, other things being equal, the greater is the temptation to discard the nets."

The following table, based on information supplied to Colonel MacArthur by Messrs. GREENINGS ar d Sons, of Warrington, correlates the mesh, I.S.W.G., the size of the aperture, and the percentage of daylight admitted, in varieties of screen-cloth likely to be employed by sanitarians.

Mesh, per inch.	I.S.W.G.	Diameter, inch.	Aperture.	Daylight, per inch.
12	28	0·0148	0·0685	67·5684
12	30	0·0124	0·0709	72·3861
12	32	0·0108	0·0725	75·6900
14	30	0·0124	0·0590	68·2276
14	32	0·0108	0·0606	71·9782
16	30	0·0124	0·0501	64·2563
16	32	0·0108	0·0517	68·4260
17	30	0·0124	0·0464	62·2205
18	30	0·0124	0·0431	60·1866
18	31	0·0116	0·0439	62·4416
18	32	0·0108	0·0447	64·7381
18	33	0·01	0·0455	67·0761
20	31	0·0116	0·0384	58·9824
20	32	0·0108	0·0392	61·4656
20	33	0·01	0·04	64·00
20	34	0·0092	0·0408	66·5856
24	36	0·0076	0·0340	66·5856
28	36	0·0076	0·0281	61·9054

As regards the fineness of mesh necessary to exclude sand-fly he considers that more work should be done; medical officers living in infested places should undertake these experiments.

[As far as we are aware this paper contains data that have never been published and which are essential to a proper understanding of the principles of screening.]

CARTER (H. R.). **Yellow Fever in Peru. Epidemic of 1919 and 1920.**— *Amer. Jl. Trop. Med.* Baltimore. 1922. Mar. Vol. 2. No. 2. pp. 87–106.

The writer gives an interesting account of an outbreak of yellow fever in Peru. We publish the summary of his work and conclusions.

Summary.

"1. In 1916, when the survey by the Rockefeller Foundation was made, Guayaquil was the key to the yellow fever situation of the West Coast of South America. It was a permanent endemic focus, from time to time infecting the coast both north and south of itself.

"The elimination of yellow fever from Guayaquil *at this time* would have eliminated it from this entire coast and probably in perpetuity. It was therefore planned.

"2. This was postponed on account of the war, and before it was accomplished yellow fever had been introduced (in early 1919) from Guayaquil into northern Peru, where it spread rather widely during

that year and the next, threatening both to reinfect Guayaquil, now free of it, and to spread into the populous districts to the south, where there was a good chance of its forming a more or less permanent focus.

" 3. In the campaign against this epidemic the ultimate dependence was exclusively on the control of Stegomyia by elimination of their breeding-places, isolation of the sick and fumigation of infected premises being disregarded.

" 4. This was pressed only at certain places of strategic importance, *key places*, and little attention paid to outbreaks elsewhere. The prime object was to *prevent further extension of infection* rather than the elimination of that already existing, except as a means to prevent extension.

" 5. It was urged that the same measures—Stegomyia control—be extended to healthy places in the south exposed to infection, *key places*, so as to render them incapable of propagating yellow fever should it be introduced.

" This was not done efficiently, reliance being placed on a military Cordon Sanitaire and the natural defence furnished by a waterless desert about 60 miles wide to the south.

" 6. Yellow fever was eliminated from the northern department, where the above campaign was undertaken, the last (doubtful) cases occurring in September, but passed the Cordon Sanitaire and was found in epidemic form in January, 1920, well to the south, where it had been some months.

" 7. General outline of plan of campaign for 1921, now being carried on by Hanson.

" 8. Importance of this work: It should free the entire Pacific coast of South America from yellow fever—and permanently."

CONNOR (M. E.). **Final Report on the Control of Yellow Fever in Merida, Yucatan, Mexico.**—*Amer. Jl. Trop. Med.* Baltimore. 1922. Nov. Vol. 2. No. 6. pp. 487–496.

As a yellow-fever focus Merida was considered by the author to be a menace to the United States, and this report describes how it was freed from the disease mainly by concentrating on the Aëdes (Stegomyia) larvae breeding in the domestic water-vessels, or " containers." The city was divided into 11 districts, with an inspector and an assistant in charge of each, and domiciliary visits were made every 10 days. They started their survey at precisely the same time from the commencement, so that the inhabitants knew when to expect the visit, which rendered friction unlikely. Each potential breeding-place was visited and its conditions noted and remedied.

The main measure employed was stocking the containers with fish, the best of which appears to be the kind of perch known as " mojarra." This is a bottom feeder, is very hardy, seems to be quite comfortable in small stores of water, and is superior to the top feeders, which are sensitive to changes of temperature.

Whenever possible metal tanks were provided, with proper lids, which were sealed by the inspector. The method of sealing, namely, two strips of adhesive plaster with the ends covered with putty to receive the official impress, is rather novel. When water was too scarce to be thrown away oiling had sometimes to be used, or the larvae were strained away through muslin. It was found that Aëdes

would breed in "Lejia" water (which appears to be water mixed with wood-ash to render it soft for washing clothes) in spite of its marked alkaline reaction.

This campaign succeeded in so reducing the number of mosquitoes that there was no danger of yellow fever spreading, and there has not been a case for the past twelve months.

New South Wales. **Eleventh Report of the Microbiological Laboratory (Government Bureau of Microbiology) for the Year 1920. Part II. Reports of Investigational Work. Division I. Infective Diseases of Animals (including Man). I. Researches on Plague.** [Ferguson (E. W.), Principal Microbiologist.]—*Report of the Director-General of Public Health, New South Wales, for the Year 1920.* pp. 137–139. 1922. Sydney: John Spence, Acting Govt. Printer. [Price 8*s.* 3*d.*]

This is a truly monumental report, and contains a great deal of very interesting matter.

There is a particularly interesting piece of investigation, the results of which should certainly be widely known, on the rat-flea prevalence at Sydney.

"In connection with routine measures taken for the detection of the presence of plague and the prevention of its spread, 6,667 rats were examined during 1920, an increase of 3,502 over the number examined in 1919, when routine work was greatly restricted owing to the influenza epidemic. Plague was not found in any of the specimens, there being thus a continuous plague-free period from April, 1910. In addition to the examination of rats, the species of fleas on each are determined as a routine measure and are shown in the following table.

"Species of Fleas.—It will be seen that the fleas collected (680) were determined as belonging to five species: *Laemopsylla cheopis* (302), *Ctenopsylla musculi* (202), *Ceratophyllus fasciatus* (169), *Ctenocephalus felis* (or *canis*) (6), and the human flea, *Pulex irritans* (1). In accordance with our usual experience *Laemopsylla cheopis* was the flea most frequently present."

A valuable chart shows the number of the three varieties of fleas present on rats month by month from 1909–19. Tables are also given for the number of fleas on each of the three kinds of rats for the year 1920, and also the number of rats caught and their species and whether they were infected or not, from 1903–20. The whole work is of great value to all interested in the plague problem.

Javelly & Bergonier. **Notes sur l'organisation du Service de Prophylaxie antipesteuse à Dakar.**—*Bull. Soc. Path. Exot.* 1922. July 12. Vol. 15. No. 7. pp. 661–667.

The writer gives an account of the measures taken at Dakar to combat plague, namely, methodical destruction of rats and rendering buildings inaccessible to rodents. The measures against rats include poison baits and toxic gases, particularly sulphur dioxide in the form of liquefied SO_2 stored in steel cylinders; and the inhabitants are taught to hunt rats with dogs.

As the ordinary native house cannot be rendered rat-proof, the inhabitants have been removed to a new settlement constructed on sound lines. This, of course, is a rather expensive measure. Great attention has been paid to shops and warehouses.

Kenya Colony and Protectorate. Medical Department. **Rats in Relation to Disease, with Particular Reference to Plague and its Prevention and Eradication by the Prevention and Destruction of Rats.**—Health Pamphlet No. 1. 16 pp. With 4 illustrations. 1922. Nairobi: Govt. Printer.

This is an official publication of the Medical Department of Kenya Colony.

Besides descriptions of the local rats and a consideration of plague as it affects Kenya, it contains general observations on the economic importance of rats and on rats in their general relation to disease, and general instructions for the management of plague-cases and for the destruction of rats.

So far as is known the rat responsible for plague in Kenya (apart from Mombasa, where a brown rat which probably is *Mus decumanus* may perhaps play a part) is *Rattus rattus kijabius*, a local subspecies of the well-known black rat. *Mus decumanus* (*Rattus norvegicus*, the brown, or ship, or sewer rat) does not occur in Nairobi or Kisumu, or in the reserves.

The local black rat (*kijabius*) is a town rat and in country districts a hut rat—in huts living and nesting almost exclusively in the roof. Another hut rat, but not quite so much a town rat, is *Rattus conchae ugandae*, the "multimammate" species, which is not known to be associated with plague in Kenya, where it is being driven out by *kijabius*.

The part played by rat-fleas is described, but nothing is said of the particular species of fleas that infest the local rats.

In the instructions for dealing with outbreaks of human plague it is unfortunate that the author should have included the destruction of rats. Such measures at that moment are useless, since there is no better agent for ridding a place of rats than the plague itself.

Rat campaigns should be carried out immediately before the plague season. The author no doubt understands the matter, since he italicizes the statement: "Where there are no rats there will be no plague"; but he does not emphasize the point of time.

With regard to pneumonic plague the author allows that it is known to be directly infectious, and admits that in Manchuria it was in this way the cause of severe epidemics, yet he gives it as his opinion that it is not directly infectious in East Africa.

With this opinion we disagree. The reviewer investigated an outbreak of pneumonic plague in British East Africa, in which each one of a large number of cases received infection from a single centre.

Bulletin de l'Office International d'Hygiène Publique. 1922. Oct. Vol. 14. No. 10. pp. 1215-1234.—**Les dispositions en vigueur, dans divers pays, concernant la destruction des rats sur les navires.**

The writer gives an account of the enactments of various countries for dealing with rats. He points out that the regulations differ in many respects in different ports, particularly as regards periodical claytonization. The following details are given for each country:—(1) The enactment ordaining periodical "deratization" of ships; (2) the authority carrying out the work; (3) the ports where "deratization" can be effectually carried out by officials; (4) the process

officially used ; (5) the certificate delivered to the ship ; (6) the official charges.

We do not consider that this information is of great interest to the majority of sanitarians in the tropics. Port health officers who desire it should obtain the paper for themselves.

BELLI (C. M.). **La distruzione dei topi sulle navi per mezzo dei gas asfissianti.** [Rat Destruction on Ships by Means of Asphyxiating Gases.]—*Ann. di Med. Nav. e Colon.* 1922. Sept.–Oct. Year 28. Vol. 2. No. 3–4. pp. 105–114.

Five gases are discussed—their mode of preparation, employment, the advantages and disadvantages of each. Hydrocyanic acid, carbon dioxide (Lafond's apparatus), carbon monoxide (the Hamburg apparatus), sulphurous acid gas, either simple by Clayton's or Halley's methods, or ozonized by the Marot-Herbelot apparatus. The subjoined table gives the chief points. The author concludes that for effectual "deratization" the holds should be empty, though this is less safe from the point of view of plague prophylaxis, that hydrocyanic acid is best because it does not damage objects, is rapid in action, and its apparatus is simple, but that it is not effectual with a full hold, and that, therefore, the problem of a really satisfactory disinfectant for plague prevention is yet to be solved.*

Gas.	Fatal to Rats.	Fatal to Insects.	Fatal to *B. pestis.*	Injurious to merchandise or vessel.	Time needed to be effectual.	Density relative to air.	Action with full hold.
Hydrocyanic acid	+	+	—	Nil.	3 hours	Lighter	Ineffectual
Carbon monoxide	+	—	—	,,	6 ,,	,,	,,
Carbon dioxide	+	—	—	,,	6 ,,	Heavier	Good
Sulphurous acid.	+	+	+	Injurious to some cargoes and to decorations of vessel.	More than 12 hours	,,	,,
Ozonized sulphurous acid.	+	+	+	,,	12 ,,	,,	,,

(Table adapted from paper.)

* Summarized by Dr. H. H. SCOTT.

Baermann (G.). **Korte handleiding voor de ontratting van Estates-gebouwen en ter verhindering van het opnieuw zich vestigen van ratten.** [Short Pamphlet on the Extermination of Rats in the Estates-Buildings, and on the Prevention of their Return.]—Serdang Doctor Fonds. 15 pp.

This short pamphlet, issued by the Serdang Medical Association, gives a popular account of the principles and practice of rat destruction. It does not pretend to be a scientific treatise, as it is intended for the education of the general public.*

North Dakota Station Bulletin 155 (1922). 4 pp.—[**Preliminary Rat Virus Investigations.**]—[Summarized in *Experiment Station Record.* 1922. July. Vol. 47. No. 1. p. 51.]

An investigation carried out in the North Dakota laboratories as to the efficacy of certain bacillary rat viruses. The results are given below; they agree very largely with common experience.

"(1) That Reefer's Rat-Viro, Alexander Rat Killer, Pasteur's Liquid Rat and Mouse Virus, and Azoa are shown by cultural methods to contain micro-organisms which could be grown on various media; (2) that not one of these so-called viruses showed any qualities whatever of contagium; (3) that none of these so-called viruses produced infection or any other apparent disease conditions in rats, as shown by the data contained herein; and (4) these investigations do not indicate that these products possess in any degree the efficiency and death-dealing qualities for rats as advertised and claimed by the manufacturers."

Bihar & Orissa. **Annual Public Health Report of the Province of Bihar and Orissa for the Year 1921.** [Ross (W. C.), Director of Public Health, and Taylor (J. R.), Supt. Engineer.]—pp. 36 + xxxv + 4. With 13 charts & 1 map. 1922. Patna: Supt. Govt. Printing. [Price Rs. 4 Ans. 12.] [**Cholera.**]

The writer gives a large number of very interesting charts of the prevalence of cholera in the various years and in various parts of the Province of Bihar and Orissa. The following excerpts represent the opinion of the writer and the conclusions from his experiments.

"Now we know that cholera is usually epidemic to a greater or less degree at the same season every year, and we know that that season is characterized by definite climatic conditions of temperature and humidity, whatever be the month. These conditions are those which favour the rapid multiplication of flies, which are known to play a prominent part in the transmission of cholera and other diseases, viz., warmth and moisture together. An excess of heat or of rainfall proves unfavourable just as much as low temperature or low humidity. The optimum point is where the conditions of warmth and moisture together are most favourable to fly breeding, which appears to be at a mean temperature of about 85° and a humidity over 70.

. . . . .

"The relationship between cholera and climatic conditions favourable to the multiplication of flies does not imply that the fly is the

---

* Summarized by Dr. Th. Joekes.

only means of transmission. It is not. But its presence in large numbers may and probably does make that difference in the balance of things which prevents or precipitates an epidemic.

. . . . .

"The only alternative possibility is the water supply, and neither the facts nor the climatic conditions support such a view, nor is it possible for an epidemic to break out almost simultaneously all over a division which has an infinite number of separate water supplies, it the water supplies are the means of spreading the infection. With a common water supply it would be possible."

From a careful survey of the graphs, and from much experience of cholera in the East, we are inclined to the opinion that the writer over-estimates the importance of flies and under-estimates the fact that general pollution of most water supplies is common with certain climatic conditions. In the first place the writer does not adduce any figures or charts to show that the rise of cholera and the prevalence of flies in any particular place actually corresponds. Secondly, he makes a statement with which we cannot agree, namely, that the cholera germ does not live long outside the human body.

There is now a great deal of evidence to show that this statement is incorrect. MORISON's work on the cholera outbreak in Poona and CLEMESHA's report on the Bombay water supply show that infection can be kept alive for many months when discharges are voided on the ground. It is certainly true that vibrios that find their way into the water die out rapidly, but when the discharges inspissate in the sun they remain capable of retaining infection for long periods. There is, we maintain, nothing in the figures quoted by the writer which definitely disproves the statement that much of the cholera reported is due to the washing of surface pollution into water supplies by heavy rain.

Of course it is thoroughly well established that flies will carry cholera virus and cause outbreaks of the disease, and doubtless they do in this Province, as in other parts of the world, but we consider that the writer undoubtedly exaggerates their importance and does not produce any convincing figures in support of his statement.

MONTHLY BULLETIN OF THE PHILIPPINE HEALTH SERVICE. 1921. July. Vol. 1. No. 1. pp. 3–7.—**Report of the Committee on Anti-Cholera Vaccination.** [BANTUG (J. P.), Chairman.]

This article deals particularly with the amount of reaction occasioned in anti-cholera vaccination. One hundred healthy individuals from the Manila police were inoculated with a dead vaccine of cholera vibrios, each receiving 1,000 million, with subsequent inoculation of 1,500 million in many cases.

The general reaction is given as follows :—

Total number of adults vaccinated	100
Number of persons showing elevation of temperature above 37° C., per cent.	56
Slight headache and pains in the joints, per cent. ..	4
Nausea	0
Diarrhoea	0
Collapse	0
Average rise in temperature	37·3° C.
Average highest rise in temperature	38·6° C.
Highest rise of temperature	38·2° C. (*sic*)

A similar number of school children from the reformatory was inoculated with 250 million and 500 million. The reaction was very much less than that of the adults; only 2 per cent. showed any elevation of temperature. As compared with typhoid inoculation the reaction is considerably less.

The following are the remarks of the committee appointed to deal with this subject:—

"1. Cholera vaccine produces less reaction than typhoid.

"2. The second injection appears to produce lesser reaction than the first one.

"3. The preparation to be used should be a vaccine which has been killed by heat of 60° C. for one-half hour and carbolized. It should contain 1,000 millions per cc.

"4. The dose for healthy adults in the Philippines should be 1,000 millions.

"5. One injection should be given in case of field vaccination on a large scale. If practicable, two injections should be given (500 to 1,000 millions).

"6. The public should be enlightened on the subject by leaflets in plain intelligible language as to the nature of the vaccination and its advantages.

"7. Anti-cholera vaccination should be practised by physicians in charge of health stations and by provincial health officers on cholera contacts.

"8. Private physicians desiring to use the vaccine should be encouraged.

"9. Sufficient funds should be secured to enable the free distribution of anti-cholera vaccine.

"10. The Anti-cholera Vaccination Committee should continue its existence, and should direct and investigate all questions which may arise during the anti-cholera vaccination campaign."

We are not altogether in agreement with this extensive programme. It is at present not certain how long the protection against cholera lasts, and by many Orientals all inoculation measures are looked upon with great suspicion. While admitting the usefulness of the measure on special occasions for special groups of people, such as a labour force travelling through a cholera zone, we rather doubt the advisability of its application to the general population.

MIYAJIMA (M.) **Cholera Epidemics in Japan and in her Colonies.**—*Jl. Trop. Med. & Hyg.* 1922. Nov. 1. Vol. 25. No. 21. pp. 337–344.

The writer gives a long account of cholera epidemics in Japan in 1912, '13, '16, '17 and '20, with the preventive measures adopted. Epidemics in Korea, Formosa and Kwantung are also described. There is nothing very new about any of these outbreaks. Alterations have been made in the quarantine laws of Japan; cerebrospinal meningitis and paratyphoid were added to the eight other infectious diseases, and the important point was laid down that virus carriers of any infectious disease may be treated on exactly the same lines as a case of the malady.

These Japanese outbreaks are very largely attributed to carriers; the authorities therefore are anxious to increase the strength of their preventive legislation. They suggest also that this matter should be discussed at the International Sanitary Conference for the revision of existing laws.

Ministry of Health. Reports on Public Health and Medical Subjects. No. 12. Dr. W. V. Shaw's **Report to the Ministry of Health on an Epidemic of Enteric Fever at Bolton-upon-Dearne.**—44 pp. With 1 map. 1922. London: H.M. Stationery Office. [Price 2*s.* net.]

The writer deals with a water-borne outbreak of typhoid in Bolton-upon-Dearne.

Bolton-upon-Dearne and Darfield derived their water supply from a disused colliery known as the Dearne Valley Colliery; it is what is known as a "day hole," that is to say, it was an outcrop of coal, there being no shaft. The seam that was worked was very near the surface; the rock between it and the soil was a very much cracked sandstone. The water supply to the village of Bolton itself, though partially obtained from the colliery source, was very deficient, so much so that the inhabitants mostly relied on the village pump, an ordinary shallow well.

Towards the end of July, 1921, cases of enteric had occurred in both the Bolton and Darfield urban districts. By July 30–August 6 the epidemic was at its height; there were as many as 10 or 12 cases per week. After this date, possibly owing to measures applied to the water, the number of cases decreased, but it was not until the end of the year that there was an entire cessation of the disease.

This outbreak seems to have been due to the fact that the area immediately above the colliery was contaminated and that this pollution passed into the water supply. Very early in October in the same year there was an entirely separate outbreak in the village of Bolton. The population of this place was only 3,570, and there were 260 cases; the maximum number per week was 58; the acute stage of the epidemic lasted about four weeks.

As already pointed out, the village did not suffer in the first outbreak because it relied on the village well for its main supply. In October this well became contaminated, probably due to a series of unfortunate coincidences. Firstly, the summer was very dry and the water in the well had probably run low; secondly, to the north and west of the well is a sandstone quarry where the rocks were very much fissured; this had been worked up to quite recently; also in the neighbourhood were several very insanitary privies. Again, towards the end of August a fair was held in a field not very far away from the quarry. The people resident in the caravans polluted the ground considerably, and this is a possible source of infection. There was some sickness amongst the showmen, and one child died. Thirdly, there was a heavy downpour of rain on October 2 and 3, which, if not the prime factor, probably very considerably increased the amount of pollution in the well, for the maximum number of cases, namely, 57, occurred a fortnight later.

As soon as the nature of the disease was ascertained measures were started for the chlorination of the water. For some reason the method of application seems to have been extremely unsatisfactory. The figures of the urban districts suggest that the water was still being contaminated by enteric bacilli many weeks after the original onset.

There were 45 deaths in both outbreaks; the incidence rate reached 19·4 per mille of the population, the death-rate 2·2. In the village of Bolton-upon-Dearne 72·6 per mille of the population were attacked.

Another interesting side-light on the methods of the Council is found in the fact that the health officer, who is paid £80 per year and has

a private practice in the neighbourhood, resigned his appointment during the epidemic, and his successor is reported "to have had no previous experience in public health administration."

The analysis of the water gives very scanty information, the only point being of indirect importance, namely, that in the sample taken on August 23, 1921, streptococci were found in abundance in quantities of 5 and 10 cc. of the water.

NORMENT, Jun. (R. B.). **Tracing Specific Sources of Rural Endemic Typhoid. An Epidemiological Study of Rural Typhoid Fever in Two Counties of Maryland.**—*Public Health Rep.* 1922. Sept. 1. Vol. 37. No. 35. pp. 2094–2108.

The writer has investigated the causes of enteric fever in a rural population—two counties in Maryland. Although this area is outside the tropics, the conclusions arrived at are of general interest.

Conclusions.

"This study would seem to indicate direct contact with bacteriologically demonstrable typhoid carriers as the most prolific source of endemic rural typhoid, and direct contact with unrecognized cases as the next most important source.

"The endemic typhoid history of the two counties studied, in former years, as indicated by focal lists, apparently shows a higher percentage of cases secondary to contact with reported cases during the active and convalescent stages than was found in the cases for the year 1920.

"It seems probable that if it could be shown that over 50 per cent. of the group of typhoid cases studied had dangerous contact with demonstrated carriers, or with unrecognized clinical cases, there must have been additional cases who had such contact not brought out in the history obtained.

"It is believed that the above experience is not unusual in the counties studied. In areas where carriers were found the relationship of the carriers to cases reported in previous years seemed strongly to suggest carrier infection. It therefore does not seem to be an exaggeration to state that probably more than 30 per cent. of cases of endemic rural typhoid fever reported each year in these counties are traceable to contact with chronic carriers, and more than 20 per cent. to contact with unrecognized cases. It may be that such a conclusion has a very much wider geographic application. If this is found to be true, the demonstration of carriers, as well as practical measures for the prevention of the spread of typhoid by carriers, should receive more careful consideration than has been given in the past. Better notification in suspected cases, with prompt institution of prophylactic measures, would also seem to be an important factor in the control of rural typhoid.

"Polluted rural water supplies and insanitary privy conditions were not shown to be a prominent factor in the causation of this group of cases. This may be due to the fact that cases associated with demonstrable sources of infection gave history of direct contact with these sources. Six of the ten carriers demonstrated lived in homes provided with protected water supplies and sanitary privies or closets. Protection of water supplies and sanitation of privies are no doubt extremely important anti-typhoid measures which should

be carried out with all vigor in rural communities, but it may be that these measures do not play as large a part in the prevention of endemic typhoid as has been believed.

"The method of investigation outlined shows many opportunities for refinement and extension. Its simplicity, however, permits its trial by county health officers and other field investigators in rural communities in connection with routine typhoid work."

FEDERATED MALAY STATES. **Medical Report for the Year 1921.** [DOWDEN (R.), P.M.O.]—51 pp. Kuala Lumpur: Govt. Press. [Price not stated.] [**Dysentery.**]

The appendices to this report contain some valuable papers, one on the bionomics of certain anopheles and another on quinine and malaria; these will be dealt with in other numbers. The section on dysentery by Dr. William FLETCHER, Acting Director of the Institute of Medical Research, is also of considerable importance.

During the past year 4,190 specimens of faeces were examined from 1,348 cases. Of 16 cases of dysentery in Europeans 11 were Flexner cases and 5 entamoebic. The disease was mild in all cases. Special investigation took place in the district hospital at Kuala Lumpur. Dysentery bacilli were isolated in 473 cases (44·9 per cent.): *E. histolytica* was found in 167 (15·86 per cent.).

Infection from Shiga bacilli was very rare; only 27 out of 473 cases were due to this organism. The death-rate from bacillary cases was 27·68 per cent. Anti-dysentery serum from the Lister Institute apparently did not affect the death-rate, for in 212 cases in which serum was used there were 27·7 per cent. deaths. A very large number of these cases were half-starved coolies who had been thrown out of employment for some time and were almost moribund when admitted to hospital; moreover, large numbers of them were elderly people. Malaria was a complication in many cases. Out of the 167 entamoeba cases 30 (18 per cent.) died; these, however, succumbed to some complication.

Some interesting experiments were carried out on the best method of transmitting faecal discharges to the laboratory for examination. It is well known that both Shiga and Flexner bacilli rapidly die out in stools unless they are examined quickly. It has been found by TEAGUE and CHURMAN that with typhoid stools a solution of 0·6 per cent. of salt containing 30 per cent. of glycerine prevents the death of the bacteria. The same solution was used by a medical officer in an outbreak in a part of the Federated Malay States, and he succeeded in transmitting samples to the laboratory, situated six, seven or eight days' journey from the patient, from which dysentery bacilli were successfully isolated in all cases.

LAPIN. [**La tuberculose de l'enfance au Maroc.**]—*Bull. Internat. de la Protection de l'Enfance.* 1922. July. No. 6. p. 487. [Summarized in *Bull. Office Internat. d'Hyg. Publique.* 1922. Oct. Vol. 14. No. 10. p. 1267.]

The writer gives some interesting pictures of tuberculosis in children in Morocco, where the disease is about as prevalent as in France. The mortality in the principal towns works out at about two per thousand of deaths. It is more frequent in walled cities.

The forms in children are: pulmonary about 35 per cent., glandular 48 per cent., bone 7 per cent., abdominal 2 per cent., skin 8 per cent. The treatment is a matter of considerable difficulty, but dispensaries, open-air schools, and educational measures are being tried.

COLIBOEUF. **Notes sur l'origine et l'évolution d'une épidémie de méningite cérébro-spinale dans le territoire militaire du Niger.**—*Ann. de Méd. et de Pharm. Colon.* Paris. 1922. Jan.–Feb.–Mar.–Apr. Vol. 20. No. 1. pp. 40–42.

The writer gives an account of an outbreak of cerebrospinal meningitis in a part of the French Congo neighbouring on Nigeria. The first case occurred amongst some travelling merchants during January, 1921, the second case in February, and little by little the infection spread. Finally there were about 3,200 cases, with a death-rate of 7·7 per thousand of the population. Prophylactic measures consisted chiefly of inter-village and inter-state quarantine; isolation of the sick was also practised. In order to render isolation strict the sick and contacts were sometimes enclosed in a protected camp.

HOLT-HARRIS (John E.) & GRUBBS (S. B.). **Weil-Felix Test for Typhus Fever. The Weil-Felix Reaction in the Diagnosis of Typhus Fever as used at the New York Quarantine Station.**—*Public Health Rep.* 1922. July 14. Vol. 37. No. 28. pp. 1675–1680. With 1 plate.

This valuable article describes the Weil-Felix test for typhus fever as practised by the quarantine authorities at New York, which may be given in the author's own words.

"We employ as a routine technique at this station, first, a tentative test, which, if positive in dilution 1/20, is followed by a second or confirmative test. The tentative test is usually made on shipboard as follows:—Prick the suspect's ear and touch the resultant drop of blood with a clean glass slide near one end. Allow the blood to coagulate. With a 2 mm. loop place at the other end of the slide one loopful of normal saline solution, three loopfuls in the centre of the slide and four loopfuls near the drop of blood, as shown in the accompanying figure. Mix the blood with the four drops of saline near it, using a wire bent at right angles instead of the loop. Separate the clot and discard it. Carry one loopful from this dilution to the three drops of saline and mix, and carry a loopful to the single drop and mix. Thus there are obtained three dilutions of serum of approximately 1/5, 1/20, 1/40. The mixing should be done up and down, from edge to edge of the slide, in as narrow a channel as possible, in order to conserve the body of the fluid. When this is done, sterilize the loop in the flame of an alcohol lamp, pick up a small amount of the culture X19 from a 24-hour agar slant, and place a little at the margin of each dilution. Emulsify first, dilution 1/40, next 1/20, and finally 1/5, going directly from one dilution to the other without flaming the loop. Pick up the slide and rotate it slowly upon its long axis against a dark background. Agglutination is shown by the appearance of white flocculi, which increase in size and are readily discernible in the stream of fluid as it flows in its narrow channel across the slide. Prompt and complete clumping, especially in dilutions of 1/40, points to typhus fever. If no clumping take place within three minutes add to dilution 1/40 a small amount of typhus

serum as control, or, if typhus serum is not available, add the serum of a rabbit immunized against X19."

This modified Weil-Felix reaction test is stated to be reliable, and greatly to expedite shipping when there is a question of typhus fever.

KRAUS (R.). **La Fiebre Petequial en la República Argentina (Prov. de Salta). La campaña profiláctica (Segunda Comunicación).** [Typhus Fever in the Argentine (Salta Province).]—*Rev. Inst. Bacteriolog.* 1921. Jan. Vol. 3. No. 1. pp. 1–34. With 34 figs., 6 maps & 5 charts.

In July, 1918, a delegate from the Department of Hygiene was sent to investigate an outbreak of disease in Molinos (Salta) and reported it as typhus fever. In three months there were 115 cases, with 17 deaths (14·78 per cent.), and further enquiries served to prove that this disease was endemic there, not imported, and that for the five previous years there had been an average of 23 deaths during the four months April to August.

The plan of campaign consisted of disinfection of houses (burning down and compensating the owners if not worth disinfecting), cleansing and disinfestation of persons and clothes, distribution of fresh clothing, instruction of adults and children—not an easy matter, as the people were ignorant and superstitious and lived in poverty and squalor—by meetings, in schools, and by placards. Orders were promulgated calling for compulsory notification of all suspicious cases.

In addition, "sanitary stations" were instituted for the delousing of the persons and clothing of all those leaving the districts affected; here, also, the men had to submit to having their hair cut, while that of the women was treated with paraffin. Other towns were warned to be on the look-out for immigrants from infected villages, and to note their places of residence in all cases.

The medical men and sanitary officials were given a short course of instruction before being sent out to the district, and the former took with them killed cultures of Proteus X19 for performance of the Weil-Felix reaction, which was done in every case.

It is proposed to bring up the question of typhus fever for discussion at the Sanitary Conference, with a view of prevailing upon all the South American countries in which the disease occurs to take proper systematic measures to prevent its spread.

The paper is illustrated with copies of photographs showing the nature of the country, the people and their dwellings. A sanitary station is also depicted, and maps are given indicating the districts involved, and, finally, graphs of the mortality in various departments in past years.

The proclamations issued by the executive authority are included in the text.*

ALLAIN & AUGAGNEUR. **Organisation de la lutte anti-vénérienne à Madagascar.**—*Ann. de Méd. et de Pharm. Colon.* Paris. 1922. May–June–July–Aug. Vol. 20. No. 2. pp. 125–150. With 1 plate.

This paper deals with the attempt made to remedy the conditions of venereal infection amongst the inhabitants of Madagascar. Diseases

* Summarized by Dr. H. H. SCOTT.

of this nature are not of recent introduction, but were reported as long ago as 1664 and 1699. They are very prevalent throughout the island ; in 1921 there were 104,545 cases in native hospitals, besides 24,714 treated in special dispensaries. Reliance was placed mostly upon the special dispensaries. The natives of Madagascar, like most primitive peoples, do not easily consent to remain in hospital for long periods, but have no objection whatever to visiting the dispensaries and receiving medicine. Treatment is entirely gratuitous.

The dispensaries were also to be used as centres of propaganda. Literature was provided describing the diseases and the method of remedying and avoiding them. 300,000 francs was placed in the budget to supply these centres with medicaments ; for the future larger sums will be required. For the proper working of the dispensaries a laboratory is required.

Hornus (Pierre). **Note sur le fonctionnement pendant l'année 1921 de l'Institut vaccinogène du Protectorat marocain de Rabat.**— *Arch. Insts. Pasteur de l'Afrique du Nord.* 1922. June. Vol. 2. No. 2. pp. 273–277.

This is an extremely interesting report of the work done in the Pasteur Institute in Morocco, where, as in most places in the East, hydrophobia is extremely common. Six hundred persons presented themselves for treatment, having been bitten by an animal supposed to be mad : in 501 cases dogs, in 17 cats, horses and cows forming the balance. In 327 cases the owner of the animal was known. Twenty-four persons were bitten on the face, nine on the trunk and 493 on the limbs. Two deaths occurred early in the treatment, one on the fourteenth day and the other on the seventeenth day ; these were instances of dog bites on the face. The Institute also provided half a million doses of anti-smallpox vaccine.

In the same number of the archives of the Institute similar anti-rabic figures are given for Tunis. In that province 1,130 people supposed to have been bitten presented themselves. Of these in 221 the animal remained under surveillance and proved not to be mad. Nine hundred and nine cases, however, were definitely treated for rabies. There were no deaths amongst those who had survived ten days after inoculation. During the year, however, six died before the treatment could affect the disease.

From these figures it is obvious that hydrophobia is very common amongst the dogs in N. Africa and that the Institutes are doing splendid work.

Indian Journal of Medical Research. 1922. Oct. Vol. 10. No. 2. pp. 295–342. With 3 maps.—**Distribution and Control of Hookworm Disease in India. Prepared by the International Health Board, Rockefeller Foundation, New York, U.S.A.**

This paper gives a review of all the literature on hookworm in India. Much of this dates back as far as 1891. With the methods used in those days the figures are of very small value. In any community the percentage of infected people varies considerably with the method of investigation. The figures obtained by Clayton Lane and Megaw and a few others are not open to this criticism ; still even these are now out of date, because it has recently been shown that the presence of eggs in the faeces is in itself of little value

in estimating the damage done by the disease. A few total worm counts are worth hundreds, if not thousands, of figures giving only the presence or otherwise of eggs in the stools.

The second part of the paper deals with the recommendations for treating the disease; although many of these are sound in themselves, recent work has shown that modification of some is necessary.

CORT (William W.). **A Graphic Analysis of Certain Factors in Hookworm Control.**— *Amer. Jl. Trop. Med.* Baltimore. 1922. Sept. Vol. 2. No. 5. pp. 449–462. With 1 text fig. & 10 graphs.

In this paper the writer uses a graphic method of showing the influence on the amount of hookworm disease of certain measures.

The graphs illustrating the result are given.

CORT (William W.).

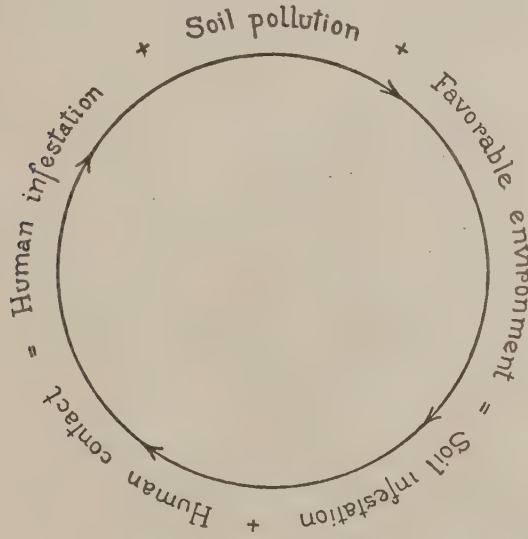


FIG. 4.—A representation of the factors involved in the spread of Hookworm Disease.

[Reproduced from the *American Journal of Tropical Medicine*.]

Conclusions.

"The analysis just given combined with recent important advances in our knowledge emphasizes the importance of giving more consideration to certain phases of hookworm control. In the first place the value of mass treatment as a control measure is emphasized. It seems to me that graph 7 shows pretty clearly that repeated mass treatment will effectively control hookworm disease even in a region where it is impossible to reduce soil pollution. The method of mass treatment in hookworm control has been advocated by Darling and his co-workers and has been put in operation by the men in charge of the International Health Board campaigns in Brazil.

"Further, a comparison of graphs 8 and 9 emphasizes the importance of carrying sanitary work to the point where soil infestation is reduced

to a minimum before the treatment phase of the campaign is started in order to eliminate the period of reinfestation. In a tropical country such as Trinidad, where the life of the infective hookworm larvae in the soil is limited to six or seven weeks, such a procedure is easily carried out. Just how far in practical control work the reduction of soil infestation by climatic conditions can be utilized (see graph 10) is problematical since most hookworm campaigns are of necessity organized on a year round basis. But it seems important in regions where there is a winter or a dry season that this factor should be taken more into consideration."

CORT (William W.):

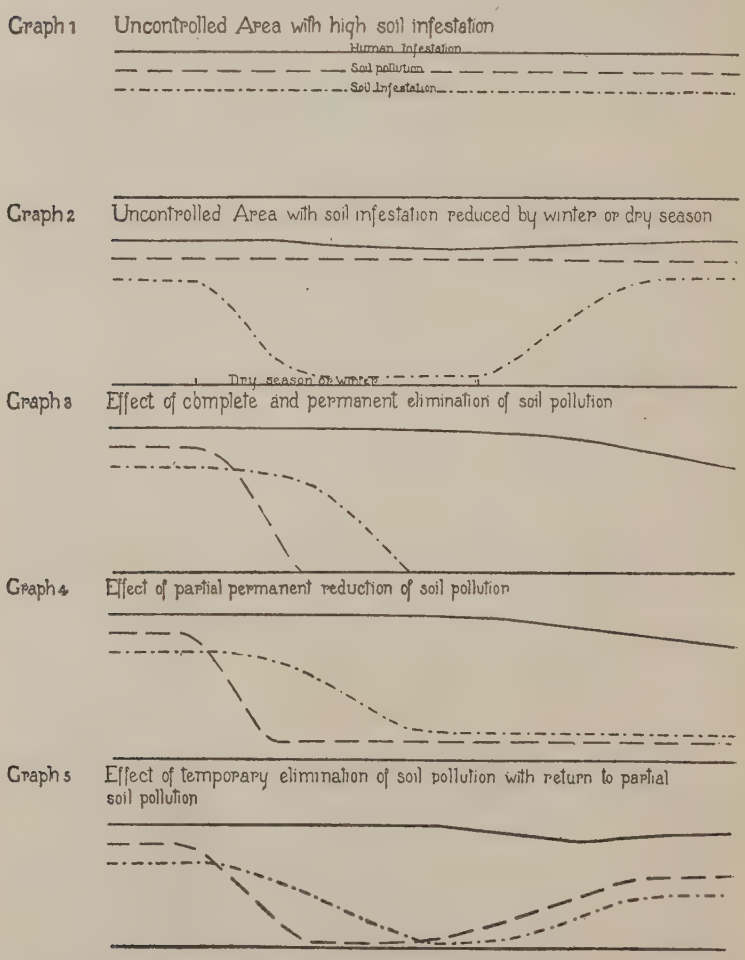

Graph 1
Uncontrolled Area with high soil infestation
Human Infestation
Soil pollution
Soil Infestation
Graph 2
Uncontrolled Area with soil infestation reduced by winter or dry season
Dry season or winter
Graph 3
Effect of complete and permanent elimination of soil pollution
Graph 4
Effect of partial permanent reduction of soil pollution
Graph 5
Effect of temporary elimination of soil pollution with return to partial soil pollution

FIG. 5.—Graphic Analysis of the relation of human infestation, soil pollution and soil infestation in hookworm control.

[Reproduced from the *American Journal of Tropical Medicine*.]

CORT (William W.)

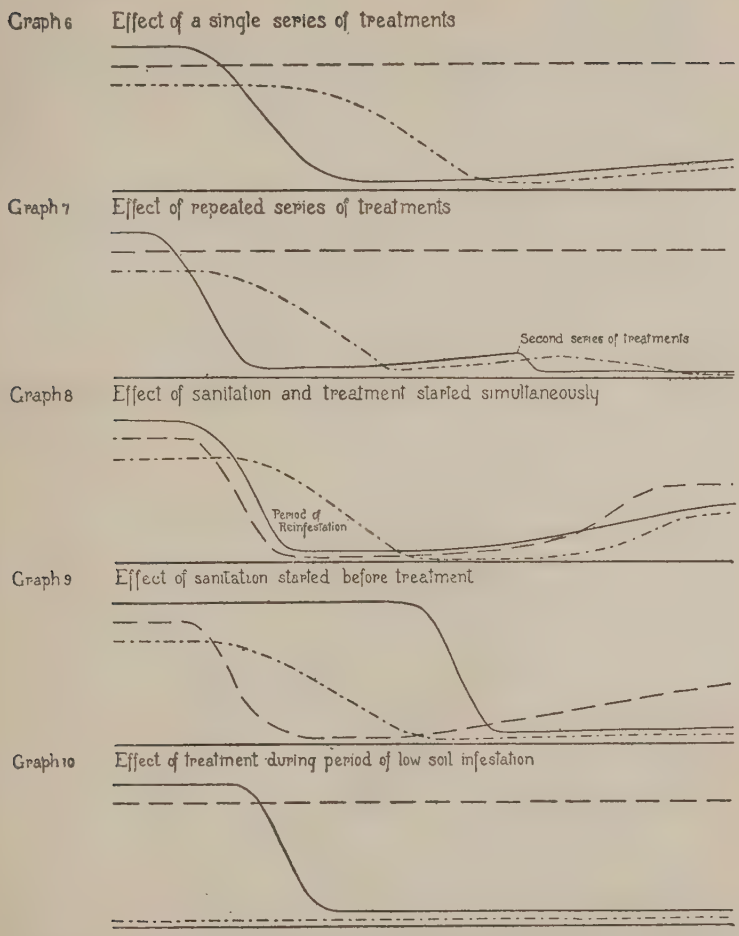

Graph 6
Effect of a single series of treatments
Graph 7
Effect of repeated series of treatments
Second series of treatments
Graph 8
Effect of sanitation and treatment started simultaneously
Period of Reinfestation
Graph 9
Effect of sanitation started before treatment
Graph 10
Effect of treatment during period of low soil infestation

FIG. 6.—Graphic Analysis of the relation of human infestation, soil pollution and soil infestation in hookworm control.

[Reproduced from the *American Journal of Tropical Medicine.*]

DARLING (Samuel T.). **The Hookworm Index and Mass Treatment.**—*Amer. Jl. Trop. Med.* Baltimore. 1922. Sept. Vol. 2. No. 5. pp. 397–447. With 3 figs. in text.

Of this interesting and comprehensive but rather prolix account of the writer's experiences of hookworm in the East, we give a summary in the author's own words.

Summary.

"The hookworm index or average number of hookworms harbored by a sample of the population is not only an indicator of the degree of infection in a group of persons, but is an index of the degree of soil

infestation and of exposure to it in the district or environment habitually used by the group.

"This index is a more accurate expression of the amount of hookworm infection in a community than a statement of the percentage of the people positive for hookworm ova; for the Uncinariasis Commission to the Orient found that of two groups of people who had 90 to 100 per cent. of their number infected with hookworm, one group had an average of only 35 hookworms per man, while the other had 273 worms per man.

"The anemia and severity of the symptoms in general correspond with the number of hookworms harbored. This may not be apparent in the individual case, because individual resistance may cloak the malignant influence of the worms which are none the less causing losses of blood and drains on the individual's powers.

"Groups of persons and types of communities possess certain characteristic grades of infection. Agriculturists usually have a high worm index, while town-dwellers have a low index.

"Intimate barefooted contact with infested soil is the factor of greatest importance in raising the hookworm index.

"Diagnosis by vermicide is more accurate than diagnosis by microscopic examination for ova.

"It is important to know more about the personal hygiene of people and sites of pollution, for what has been called racial immunity may be nothing more than the results of different degrees of exposure to infested soil following different occupations, etc.

"The relative immunity of the negro in the south and the apparent higher susceptibility of the white man may be due to the scattering of infection by the necessities of his vocation in the former, and the concentration of infestation in highly polluted nests by the whites.

"There is some correspondence between the number of ova discharged in feces and the number of female hookworms harbored when large numbers of cases are considered.

"Recent work by Baermann and Cort and Augustin lead us to believe that embryos of hookworms do not live for a long time in the soil, but in the tropics, at any rate, survive but a few weeks.

"In hookworm control it would seem to be strategic to treat by vermicide all the people in a community within as short a period of time as possible, so that soil pollution and soil infestation will not continue, but be abruptly terminated, and so that there will be no reinfection of those already treated. Mass treatment of entire communities is recommended wherever it is practicable. It is believed that when an entire community is purified of most of its worms by mass treatment within a few days, very few hookworm embryos will be passed to infest the soil, and the latter instead of remaining highly infested, as before treatment, rapidly becomes lightly infested and only light and relatively very harmless infections can result.

"In places like China, where agriculture is only economically possible through the use of dejecta as fertilizer and where hookworm campaigns are not thought to be feasible, it would seem to be possible to rid the soil of hookworm larvae by mass treatment of communities."

CLARKE (W. T.). **Ant Control on Ship Board.**—*Jl. Econ. Ent.* 1922. Oct. Vol. 15. No. 5. pp. 329–333.

This paper deals with the ridding of ships from ants, which, as everybody who has visited the tropics knows, may render the quarters of both passengers and crews almost uninhabitable.

The writer describes his experiences of a voyage in the Pacific Mail Steamships Company's steamer "Columbia," from San Francisco to Baltimore and back through the Panama Canal. During the colder part of the voyage no ants were seen, but as soon as the ship approached the tropics ants became a grave nuisance, getting into the passengers' beds and frequently preventing sleep, owing to the poisonous nature of their bites.

The ants in question are *Monomorium* (*Parholcomyrmex*) *destructor*, a species originally Indian, but now pretty universally found in boats in the tropics.

The writer used several methods to poison the insects, but was most successful with formula C, a powder which can be dusted into beds without causing any discomfort.

The formulae A and B do not appear to be very successful. There is, of course, no doubt that for cargo boats treatment, when they are empty, with HCN is probably better than the methods here given, but these can be used any time during a voyage without discomfort to the passengers or crew.

Formula A.—Government Formula for Argentine Ant Poison.

Granulated sugar	9 lb.
Water	9 pts.
Tartaric acid (crystallized)	6 gm.
Benzoate of soda	8·4 gm.
Boil slowly for 30 minutes. Allow to cool.	
Dissolve sodium arsenite (C.P.)	15 gm.
In hot water	½ pt.
Cool. Add poison solution to syrup and stir well. Add to the poisoned syrup :—	
Honey	1¼ lb.
Mix thoroughly.	

Formula B.—Formula for Native Ant Poison.

White arsenite	2 oz.
Caustic soda	2 oz.
Sugar	1 lb.
Water	1 pt.

Formula C.

6 parts by bulk—Sodium flouride.
2 ,, ,, Pyrethrum (Buhach) powdered stems and flowers.
2 ,, ,, Corn starch.

McDaniel (E.). [**Cockroaches : Methods of eradicating this Troublesome Pest.**]—*Michigan Agric. Expt. Sta. Qtrly. Bull.* East Lansing. 1922. Aug. Vol. 5. No. 1. pp. 38–39. [Summarized in *Rev. Applied Entom.* 1922. Dec. Vol. 10. Ser. B. Pt. 12. p. 227.]

"A successful poison bait [for cockroaches] consists of three cups of linseed meal, mixed with water into a thin mash, one cup of molasses (not corn syrup), and one yeast cake softened in a cup of water and allowed to stand until it ferments ; to this 2 tablespoonfuls of lead arsenate should be added when mixed. This bait is most effective where the cockroaches have little or no water. As the period of fermentation is short the bait should be renewed every few days. Powdered borax may be substituted for sodium fluoride (which, though the best method of destroying this pest, is poisonous to man) and can be mixed with one-fourth as much fresh pyrethrum."

CONSERVANCY.

KHALIL (M.). **A Consideration of Methods of Sewage Disposal in the Tropics, with Special Reference to Helminth Infection.**—*Brit. Med. Jl.* 1922. Aug. 26. pp. 360–361.

The author was a member of the recent expedition from the London School of Tropical Medicine to British Guiana. He points out that in the tropics medical officers who have been educated in Europe have been disposed to look upon the bacteria in sewage as much more important than any other form of pollution. He, however, considers that the ova from helminths are actually of greater importance from a sanitary point of view, and says quite rightly that in tropical countries the disasters brought about by hookworm disease often surpass those due to bacterial infections; further, that sewage farms should not be encouraged in the tropics, as they become veritable concentrated cultures of hookworm larvae.

There is no doubt that some of the methods of disposal of sewage require a good deal of overhauling in the light of some recent work on hookworm and helminth infection generally.

HAYDON (L. G.). **Memorandum on the Disposal of Animal Manure and Garbage in Relation to Fly-Breeding, and the Prevention of Enteric Fever and Other Intestinal Diseases.**—*S. African Med. Rec.* 1922. June 24. Vol. 20. No. 12. pp. 230–232; also *Med. Jl. S. Africa.* 1922. June. Vol. 17. No. 11. pp. 228–230.

The author quotes the enteric fever figures for the last five years in the Union of S. Africa. The numbers are between 4,500 and 5,000 per annum, but if the returns from the native population were correctly added the figures would require to be multiplied by three.

He considers that much of the disease is fly-borne and proceeds to describe what we believe should be known as ROUBAUD's method of the disposal of rubbish and stable litter.

The writer describes an apparatus which is known as Baber's, or Barber's [both spellings are given in this article], method of disposal, consisting of a concrete floor with a vertical sided drain surrounding it. The only difference between this and the original suggestion of M. ROUBAUD is that the South African model is provided with a wire netting fence so that the rubbish may be packed tight. The method has been described frequently by Indian sanitarians, notably Majors CRAGG and PATTON. It was used throughout the whole of the Mesopotamia campaign with excellent results. The method consists in packing rubbish and stable litter into tight heaps. The fermentation which results kills or drives out the fly larvae, which fall into the drain and are disposed of. The only new feature is the application in the Union to street and house rubbish, provided always that cinders and tins, etc., are excluded. The more stable litter contained the better, but street sweepings, which are entirely vegetable in origin, if packed tight, will also ferment and give a considerable rise in temperature in the centre of the heap.

The author says the method is extremely successful. He points out that the screening of sewage works can be disposed of in the centre of heaps, and that on the ground of economy ordinary cobble stones can be used for the floor. If plenty of ground is available, and particularly if the rubbish is largely horse litter, the wire fence

is quite unnecessary ; the heaps, however, require to be rammed hard round the edges. If the rubbish is largely leaves and vegetable refuse doubtless the wire fence facilitates matters. We entirely agree that it is one of the most sat sfactory methods of disposal of rubbish, but it is certainly not new.

DAS (Jahar Lal). **A Few Observations on the Trenching of Night-Soil.** [Abstract.]—*Jl. Roy. San. Inst.* 1922. Nov. Vol. 43. No. 3. p. 133.

"The Circular issued in 1909 by the Sanitary Commissioner for Bengal regarding the proper management of trenching grounds, enjoined that a trenching ground should be divided into three plots and each plot should be trenched in the first year and cultivated for the next two years, with a view to preventing it from becoming 'sewage sick.' It also laid down that for every 25 gals. of sewage 16 sq. ft. of land (*i.e.*, a trench measuring 8 ft. long and 2 ft. broad) would be required. Calculating on this basis the total amount of land required for trenching the excreta of every 1,000 of the population would be about $1\frac{1}{3}$ acres for three years. Being in charge of the town of Maniktala, and unable to obtain the amount of land required, 67 acres, the population being 53,000, the writer had the trenches made $1\frac{1}{2}$ ft. to 2 ft. deep, 2 ft. wide, and filled about a third of their depth with night-soil and retrenched each plot in which examination showed that the excreta had been transformed into a sort of loose black earth, with no trace or odour of faecal matter. In a highly *ripe* (or repeatedly trenched) soil it took nearly five, but never less than four months for such a change to take place, irrespective of weather conditions, whereas with a *virgin* soil it took about three months more for the excreta to acquire this character. He concludes that it is safe to retrench each ripe plot every six or seven months, *i.e.*, to trench each plot about half-a-dozen times instead of only once in three years. This means a very great reduction in the initial cost of acquiring land and laying out a trenching ground."

MINETT (E. P.). **A Cheap Type of School Latrine for Country Districts in the Tropics, in Relation to Ankylostomiasis and other Diseases.** —*Trans. Roy. Soc. Trop. Med. & Hyg.* 1922. June 22. Vol. 16. No. 3. pp. 119–121. With 1 fig. (Discussion, pp. 122–124.)

The accompanying figures give the plan of a very ingenious small septic tank latrine provided for a school of 250 children in British Guiana. The plans of this small circular type of septic tank have been described in Supplement No. 1, March, 1921. It should be explained that part of the merit of the latrine is its cheapness and that the designer succeeded in getting a large number of circular pipes for nothing. Under the circumstances in which it was built it has been a decided success. Multiple circular tanks, however, are nothing like as satisfactory as one rectangular one, nor are they as cheap, so that although the latrine is interesting as showing what sanitarians can do, it is not a type that we should recommend.

It will not compare in efficiency and general excellence of design with the Aqua privies that are now being constructed in Bengal. These work on exactly the same principle, namely, that the user of the latrine has to add the flush water with his own hand out of a tank ; on the ground of expense no mechanical flush is fitted.

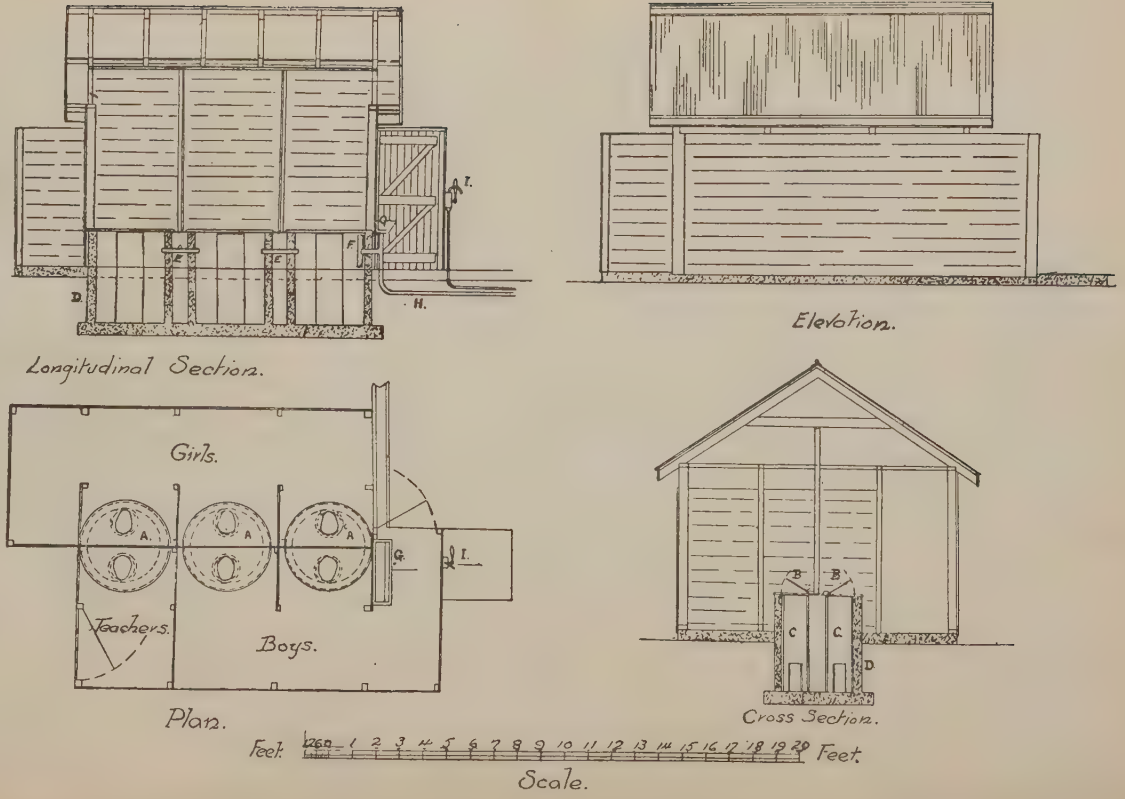


FIG. 7.—School latrine. New Amstel.

A. Wooden lids with two holes.
B. Fly-proof flaps.
C. Internal drain pipe (1 ft. diameter) with slots at bottom.
D. External drain pipe (4 ft. diameter), each containing two smaller pipes (C), and set in cement base).
E. Communicating pipes between septic tanks.
F. Overflow with submerged exit and cleaning eye.
G. Urinal connecting with effluent pipe.
H. Effluent pipe.
I. Pump for water supply.

[Reproduced by permission from the *Transactions of the Royal Society of Tropical Medicine and Hygiene*.]

Bishop (E. L.). **Soil Pollution, a Public Health Problem of To-day.**—*Southern Med. Jl.* 1922. Aug. Vol. 15. No. 8. pp. 625–631.

There is little that is actually new in the paper, which deals with the general subject of soil pollution, particularly as regards the spread of intestinal diseases of the typhoid kind, and hookworm.

In the selection of a type of privy for community installation in rural districts attention should be given to the soil formation and the soil reaction, which has an important bearing on the survival of pathogenic bacteria, and the ground water level; also to the economic status and the individual purses of the community to be served.

Pike (Alfred). **Work of a Sanitary Inspector in the Country Districts of South Africa.**—*Surveyor & Municipal & County Engineer.* 1922. Dec. 1. Vol. 62. No. 1611. pp. 345–346.

The following interesting and amusing extracts are taken from the above. The description of the sanitary methods will appeal to all who are accustomed to the East. The writer, however, says nothing about the prevalence of flies; one would think from his description of the disposal of night soil that it was likely to cause very great fly prevalence; possibly the dry nature of the atmosphere in Rhodesia prevents this.

"The sanitary system in vogue in the country town is the bucket system for stercus removal, and the refuse is removed in carts or box wagons, much the same as in any other town. With regard to the bucket system, almost every town works on a different plan; some are up-to-date and others very crude; in the latter the inspector will find much scope for energy. The most up-to-date towns give a nightly service and a clean receptacle every service, and employ the stamped steel pail with airtight covers, which are removed from the clean bucket and placed over the one used and then removed to the van which conveys the contents to the sanitary pits or dumping ground.

"Other towns give a bi-weekly or tri-weekly service, with a clean bucket say every week, which cannot be recommended, as the smell from the pail which has been emptied and not renewed is very obnoxious. The contents of the pails in the last-mentioned system are generally removed in the old-fashioned tumbler-carts, which are to be found about the town any time between 11 p.m. and 4 a.m., and if you happen to strike one of the dreadnoughts when 'coming home after a night out' there is a general stampede, or if you have left your windows open during the evening to get a little cool air you may awake dreaming that you are being gassed. This is a happy-go-lucky country; nobody worries and we are blessed daily with God's sunshine, which is a destroyer of germs, with the result that although in many instances our methods of carrying out sanitary arrangements are crude the open spaces and sunshine keep the places fairly healthy. The reason why many towns do not go in for up-to-date methods of sanitary service is generally on account of expense and the necessity of imposing taxation. However, I will try and convey one reasonable and fairly satisfactory way of removing the stercus and a system I have introduced in Umtali since taking over the duties of town clerk and engineer,—which means I am head cook and bottle washer.

"The system entails the use of a wagon which contains a 500-gall. tank for the stercus, a 100-gall. tank, called the washing tank, for the solution of disinfectant, and a 10-gall. drum of crude disinfectant. The cart or wagon leaves the depot, say at 11 p.m., with the 100-gall. tank full of clean solution of disinfectant and 10-gall. drum of crude

disinfectant and say three dozen clean disinfected buckets. This wagon patrols the section of the town allotted to it. The natives who collect the stercus each start with two or three clean buckets, which they place in their respective positions and return with three used ones, the contents of which are emptied into the stercus tank. The native in charge of the tank has the dirty buckets washed immediately and then puts them on the 10-gall drum of disinfectant and by gently pressing down the upturned bucket the inside is sprayed with a light coat of crude disinfectant and the bucket is again ready for use. This goes on every night until the section of the town is complete, thus giving a nightly service and a clean disinfected bucket each service. This system saves much wear and tear in buckets and can be recommended as cheap and efficient.

. . . . .

"The best system I find is to dump the rubbish into a huge heap, picking out the tins and bottles and daily to pour the stercus over it; then the stercus also is covered daily by the refuse collected in towns, and so it goes on. You run about four such heaps and when twelve months' old it is put through a disintegrator and is ready for putting into sacks and carting away as manure or using as a fertilizer with the planting machine. These heaps dry out and can be handled without any unpleasantness as our winters here are favourable for such work, there being generally about five to seven months without rain."

STAFFORD (H. N.) & WARD (A. R.). **Some Data on the Bio-Aeration of Sewage.**—*Jl. Roy. Army Med. Corps.* 1922. July. Vol. 39. No. 1. pp. 43–50. With 1 fig.

This paper gives a description of the results obtained from a small model of the Activated Sludge plant, making use of paddle wheels as stirrers instead of compressed air, on the same lines as the Sheffield installation.

From the accompanying sketch of the miniature plant it will be seen that it is an extremely ingenious arrangement; each charge of sewage was only 1 gall. in quantity.

The apparatus was first worked on the continuous flow system; as was to be expected with such small plant, it worked very much better on the "fill-and-draw" system. The results obtained even with this small installation corresponded very largely with those obtained in installations dealing with millions of gallons per day. It is hardly necessary to give the figures as they correspond in every way with those already published.

The writers then proceed to make certain estimations of the number of bacteria disposed of by this small installation. The summary of their findings are given below.

	Period of Agitation.		
	5 mins.	6 hrs.	24 hrs.
Total number of bacteria in 1 cc. of liquor after settlement	194,000	50,000	26,300
Percentage reduction.. ..	—	74·0	86·0
Number of *B. coli* (or closely allied forms) in 1 cc.	70,000	5,900	1,840
Percentage reduction.. ..	—	92·0	97·0

Nature of sample: Crude sewage and activated sludge.

They point out that other workers, notably COURMONT and ROCHAIX, obtained apparently better results in the sewage which they worked with, because it contained more bacilli to start with. The authors, however, allowed a 5-minutes' settlement with activated sludge before they took their crude samples. The falling off in bacteriological contents is of course remarkable, but is what one would expect from this process.

The authors then repeated the experiment with a boiled, and therefore a sterilized, sewage, and drew the following conclusions from their results.

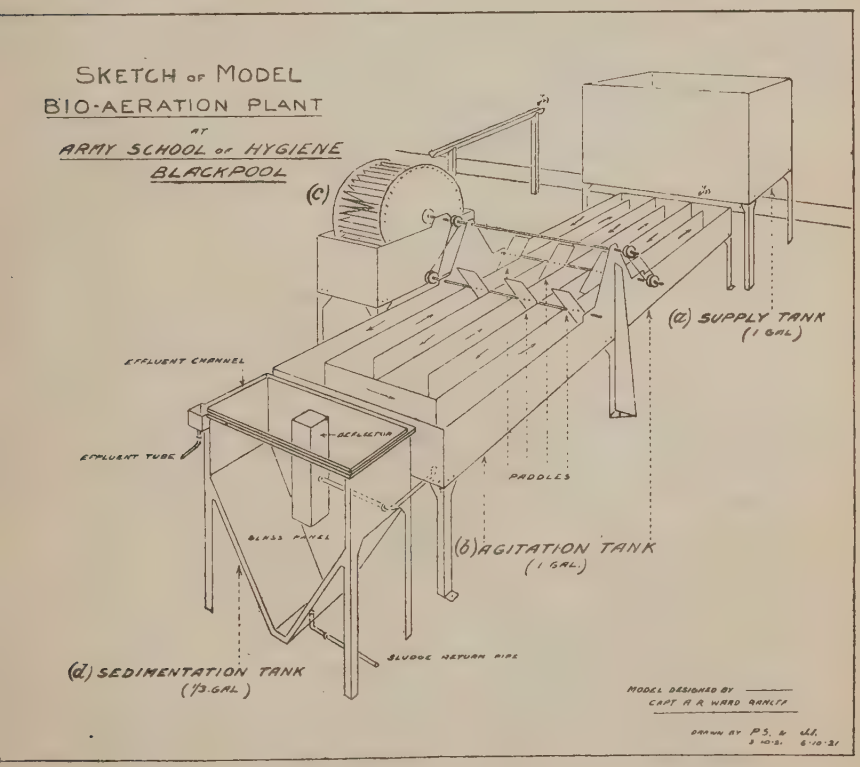


FIG. 8.

[Reproduced by permission from the *Journal of the Royal Army Medical Corps.*]

" (i) That in a bio-aeration plant working to standards of chemical efficiency, there is a marked diminution of organisms, and particularly of coliform organisms, in the final effluent, but not any better reduction than is obtained by other recognized methods of sewage purification.

" (ii) That the reduction factor of *B. typhosus* is much more marked.

" (iii) That the coliform organisms are not, however, mere intruders, but probably play an active part in purification, the process being retarded in the absence of live sewage organisms.

" (iv) That sterilization of the effluent may be effected by the addition of four parts per million free chlorine from bleaching powder.

Courmont, Rochaix and Laupen " state that action normally ceases with the disappearance of ammonia, and that by this time the bacterial purification is very variable and rarely over 50 per cent. Much longer aeration would be needed to reduce *B. coli* markedly, and after the usual period of chemical purification—they found six hours sufficient —pathogens of the typho-coli group would invariably be found, though Cholera vibrios disappeared."

Whilst we are not quite prepared to accept the explanation of this phenomenon given by the authors, most of the conclusions may be looked upon as correct.

The authors then deal with the paper by RICHARDS and SAWYER, reviewed in this *Bulletin* (Sanit. Supp., No. 3, 1922), and seek to explain some of their results of the work done on protozoa in activated sludge. Of course it is easy to criticize these experiments. Boiling of sewage is likely to alter its constituents, both chemically and bacteriologically, so much that it is not very safe to draw conclusions from results obtained in this way ; at the same time it is extremely difficult to know how sewage can be rendered free from living organisms without altering its chemical composition very materially.

HONEYSETT (A.). **The "Low Power" Activated Sludge Process.** [Correspondence.]—*Surveyor & Municipal & County Engineer.* 1922. Nov. 10. Vol. 62. No. 1608. pp. 295–296.

" The accompanying sketch will make clear the method by which the advantages claimed for the new process are obtained, the conditions which it is desired to fulfil being the following.

" 1. The construction of the aeration basin in the form of one or more endless channels so proportioned that the product of its cross section and the head necessary to maintain the desired velocity is a minimum.

" 2. The arrangement of such a channel on plan so that compactness of disposition upon a site shall be combined with a minimum of loss of head due to bends.

" 3. The application of power at one point only so as to avoid mechanical or other transmission.

" 4. The economical return of the activated sludge (withdrawn with the effluent) to the circulating system.

" The plan shows the method by which in the writer's opinion these conditions can be most economically fulfilled and will apply with the appropriate change of scale up to 1,000,000 galls. per day, which is probably as large a quantity as most engineers would care to deal with in one unit, although the principle can be applied to even larger volumes.

" The arrangement shown is capable of accommodating the usual variations of sewage flow and also the addition of rain water up to three times the dry weather flow, the only part of the works affected by such variation being the detritus tanks. These are so designed that the amount of sewage contained in them at one time does not exceed that due to a certain predetermined duration of flow (say 30 to 60 minutes), so that septic action shall not be initiated in them. The detritus is removed by hydrostatic pressure, the tanks being placed at such a level as to enable this to be done. It can then be

HONEYSETT.]

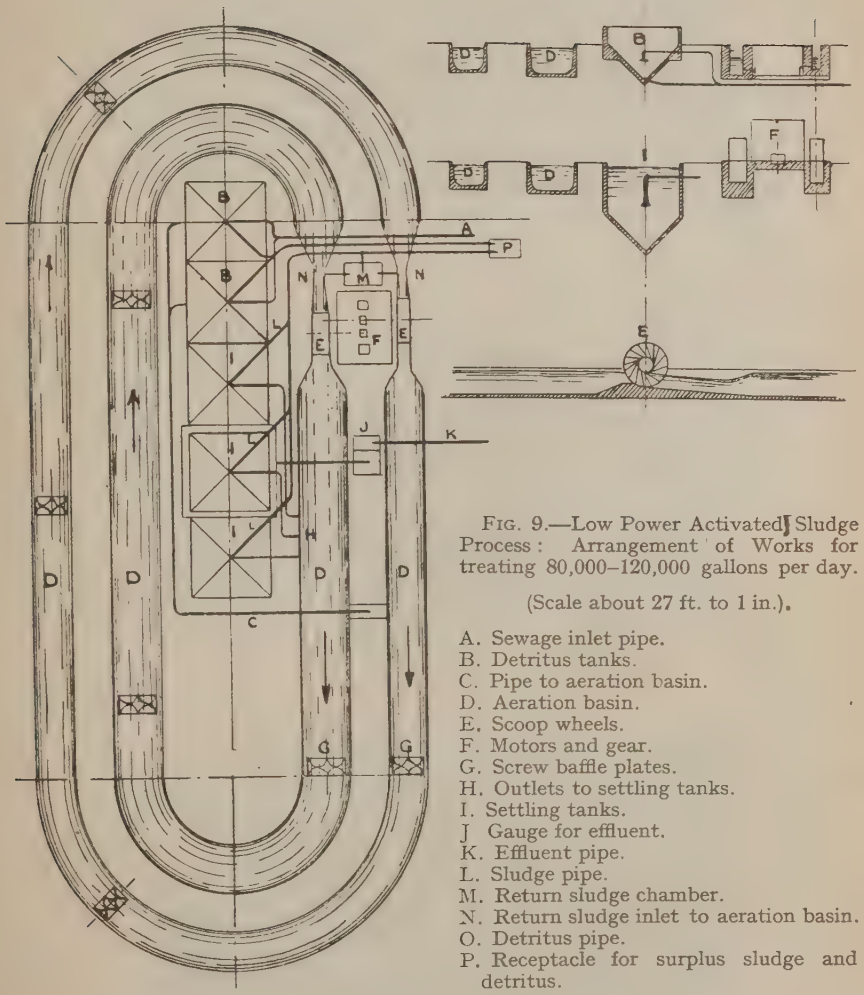


FIG. 9.—Low Power Activated Sludge Process: Arrangement of Works for treating 80,000–120,000 gallons per day.

(Scale about 27 ft. to 1 in.).

A. Sewage inlet pipe.
B. Detritus tanks.
C. Pipe to aeration basin.
D. Aeration basin.
E. Scoop wheels.
F. Motors and gear.
G. Screw baffle plates.
H. Outlets to settling tanks.
I. Settling tanks.
J Gauge for effluent.
K. Effluent pipe.
L. Sludge pipe.
M. Return sludge chamber.
N. Return sludge inlet to aeration basin.
O. Detritus pipe.
P. Receptacle for surplus sludge and detritus.

[Reproduced by permission from *The Surveyor*.]

mixed with the surplus sludge from the aeration basins and by imparting a granular nature to the latter greatly facilitate its dewatering.

"The mixed sewage and sludge in the aeration basins is best kept in motion by scoop wheels, the object of which is not only to maintain the required velocity but also to impart to the liquid an additional head, which is gradually absorbed by the stirring devices introduced at various points along the channels.

"There need be only one wheel in each channel and these can be so placed that the driving machinery is in close contact with each of them; mechanical transmission of power is therefore unnecessary.

"The stirring devices consist simply of modification in the section of the channels of such a nature that at each one of them the whole content of the channel revolves through a quarter turn round a longitudinal axis; the whole of the liquid is thus brought to the surface after passing four such points, and as on account of the large capacity of the basin this operation is repeated some 300 times, the incoming sewage must be subject to a very complete stirring before it can escape as purified effluent.

"In these operations there is nothing essentially different to those usually performed in the activated sludge process, but the methods employed are directed by the reduction of the hydraulic head lost in friction in the channels and in the stirring operations to the economising of the power employed. How important this economy may become will be appreciated when it is considered that the quantity of liquid circulated in the aeration channels is so great that in a large installation each inch of head may easily represent an amount of power equivalent to a capital sum of £1,000.

"By very careful design it appears that the total loss of head can be reduced to something between 3 and 6 in., according to the size of the installation and that in the 1,000,000 gall. unit the amount of power required for all purposes will not exceed 10 h.p.

"The return of the sludge to the circulating system is effected in what is believed to be an entirely novel manner by taking advantage of the 'Venturi' head produced by the increased velocity which of necessity occurs in the flow when passing the scoop wheel race. By this means this essential operation is performed without any special apparatus and by the utilization of power that would otherwise be wasted.

"It only remains to add that not only is the machinery needed small in amount and of a standard character, but the structural work is also of an inexpensive nature, and this fact combined with the great saving in power, will enable works to be carried out at a cost, including capitalization of the working expenses, of less than one-half that of the present methods."

SURVEYOR & MUNICIPAL & COUNTY ENGINEER. 1922. Sept. 29. Vol. 62. No. 1602. pp. 197–198. With 4 text figs.—**Bio-Aeration at Sheffield. Details of Conversion Scheme: Visit of Sewage Works Managers.**

In Sanitation Supplement, No. 3, Oct. 30, 1921, were given the plans of the bio-aeration of sewage at Sheffield. The following interesting pictures, taken from the "Surveyor," give a very clear idea of what the plant looks like.

Fig 10.—General View of Sheffield Bio-Aëration Plant.

Fig. 11.—Aëration Tank, showing Paddle Wheels and Motor House.

Fig. 12.—Aëration Tank End and Settling Tanks.

[Reproduced by permission from *The Surveyor*.]

FOOD.

UNDERHILL (T. J.). **Points of Interest respecting Preserved Food, more particularly that supplied to the Fleet.**—*Jl. State Med.* 1922. Aug. Vol. 30. No. 8. pp. 336–355; *Jl. Roy. Nav. Med. Serv.* 1922. Oct. Vol. 8. No. 4. pp. 241–257.

This paper gives in valuable detail the method of preparing, sterilizing and handling certain preserved foods, such as preserved meat and tinned milk. The author confines his attention to articles of diet which are employed by the Navy, pointing out that the maximum amount of tin allowed under any circumstances in any food product intended for the Navy is two grains per pound. Certain of the unsweetened tinned milks, as well as carrots, tomatoes, onions and black currants, have considerable action on tin. Recently a method of preparing the tinned plates, of which tins are constructed, with a lacquer of shellac and sandarac heated to a temperature of 250° has been found to reduce the action of the contents on the tin itself.

The writer remarks that the saltpetre used in corned beef to preserve the red colour of the meat has, when eaten continuously, a prejudicial action on digestion, as have most of the preservatives used in tinned goods. They are not really a necessary part of the process.

He also mentions the superiority of paint to lacquer for the outside of tins.

Dealing with corned beef the author says that on an average 30 oz. of tinned beef are equivalent to 49 oz. of ordinary beef, owing to the extraction of a good deal of water.

As to tinned milk, the greater the condensation of the milk the greater the risk of bacterial infection in the tin. The author is strongly of the opinion that the manufacture of tinned milk from skimmed milk is a public scandal and should be prohibited.

The large firms with well equipped factories, who look after their staff well, manufacture the highest class preserved foods; it is the small firms with lack of capital that require the most attention.

MINISTRY OF HEALTH. **Meat Inspection. Memorandum on a System of Meat Inspection recommended by the Ministry of Health for Adoption by Local Authorities and their Officers.**—Memo. 62. 1922. pp. 1–8. London: Ministry of Health. [Price 1*d.* net.]

This memorandum gives the Minister of Health's instructions to Inspectors engaged in examining cattle and meat for food. Though there is nothing new about it, it is an extremely useful pamphlet, and Health Officers are recommended to distribute copies to their subordinates with instructions to follow its procedure.

MANSELL (R. A.). **The Chlorination of Milk.**—*Jl. Roy. Army Med. Corps.* 1922. Nov. Vol. 39. No. 5. pp. 372–377.

Experiments on the value of chlorinating milk in order to prevent it from becoming sour. The chlorine was added in the form of liquor made from bleaching powder which gave 1·87 per cent. of available chlorine; the amount added varied from 0·5 to 2·5 cc. per 100 cc. of milk.

As would be expected, this sterilizing fluid reduced the number of colonies present very greatly and prevented the milk going sour in 24 hours.

The samples used were obtained from the Government dairy farm, and had been pasteurized and put in sealed bottles. Experiments were also carried out of adding typhoid bacilli and cholera vibrios and Flexner's bacillus of dysentery to the milk. The amount of chlorine solution varied in this series from 2·5 to about 6 cc. per 100 cc. of milk, with the result that cholera and enteric bacilli were all killed in something between one and two hours. Flexner's bacillus appears to be slightly more resistant to chlorine than the other two.

Naturally the above solution added taste and smell to the milk; it is apparently perceptible to the ordinary person in as small quantities as 2·5 to 3 cc. per 100 cc. of milk.

The results of the experiments are what one would naturally expect from the use of chlorine; from an academic point of view they are fairly interesting, but we do not see their practical advantage, as the same results could have been obtained by boiling the milk, and if the sanitary conditions in the dairy are good and the bottles thoroughly clean pasteurization is usually sufficient protection. As long as the bottles remain sealed the milk will not go sour within 24 hours in a well constructed Indian house with a fairly cool larder, particularly if it is possible to stand them on ice.

WATER.

HOUSTON (Alexander). **Some General Notes on the Future of Chlorination.**—*Metropolitan Water Board, Sixteenth Ann. Rep. of the Chem. & Bact. Examination of the London Waters for the Twelve Months ended 31st March, 1922.* pp. 17–21.

"In considering the future of chlorination, the following points should be borne in mind:—

"The typhoid bacillus* is believed to be the cause of typhoid fever and is a microbe more easily killed than B. coli.

"The destruction of B. coli by means of chlorination is readily carried out, and the process is exceedingly cheap, both as regards capital outlay and working costs.

"There are three main objections to chlorination:—

"(*a*) *'Doped' water.*—Many persons object most strongly to drinking what they call a 'doped' water, and consider that the use of chemicals for purification purposes is worse than playing with black magic. Logically, these people should drink only deep well water and water from virgin moorland, or upland, sources of supply. Obviously, a river draining populated areas, and therefore exposed to sewage pollution, is inadmissible in their case, for apart from trade wastes, the amount and variety of chemicals poured down house drains and ultimately reaching our rivers gives food for thought. Truly, it is not the nature and amount of these chemicals which matters so much as their ultimate combinations. Many pass into a practically insoluble state, others, originally harmful, are rendered inert by combining with other substances. For example, both caustic soda and sulphuric acid are irritant poisons, but combined in suitable proportions they yield sodium sulphate (Glauber's salt), a mild aperient, liver stimulant and anti-rheumatic remedy, taken daily throughout most of their lives by a very large number of people. The writer is far from flouting sentimental considerations, but if rivers are to be used as sources

---

* "Protection against typhoid fever stands for freedom from other epidemic water-borne diseases."

of water supply, we must look rather to the innocuous character of the 'finished product' than to its antecedents. There is absolutely no convincing evidence that a properly chlorinated water is in any way injurious to health.

"(*b*) *Questions of taste.*—A serious argument against the use of chlorine is that the treated water has sometimes a most unpleasant taste. Apart from emergencies, when the safety of the supply is the governing consideration, this is an objection which cannot possibly be ignored. It is curious how comparatively easy it is in some cases and how difficult it is in others to supply a chlorinated water free from any suspicion of taste. London has been fortunate in this respect, but only by the exercise of vigilant scientific control. For six years 70–80 million gallons of *raw* Thames river water (for filtration at the Sunbury, Kempton Park, West Middlesex, and Grand Junction Works) have been chlorinated daily (*except* during floods) without any taste troubles having arisen. 30–40 million gallons a day of *raw* New River water have been chlorinated (*plus* permanganate treatment at times) during the winter months of recent years with conspicuous success, if the early experimental periods are excluded. Certainly, during 1920–21 and 1921–22 no complaints of taste have arisen during periods of treatment (with occasional breaks) of 78 and 122 days respectively. For *over* six months (July, 1921 to January, 1922) Chelsea filtered water (14 million gallons per day) was successively chlorinated (*plus* permanganate treatment at times) and practically no complaints of taste were received. Deptford Twin Well (about 1 to 1¼ million gallons per day) has been chlorinated since August 13th, 1921, with variable results as regards taste. By a process of super-chlorination and de-chlorination all taste troubles appear now to have been successfully overcome.

"(*c*) '*Short-cuts*' *to purity.*—The very fact that chlorine treatment is so successful is apt to encourage 'short-cuts' to purity. How far it is permissible to gamble on the apparent safety conferred by chlorination as an excuse for an otherwise inadequate filtration plant is matter for controversy. The 'chlorinators' say, if safety is to be judged by destruction of B. coli, no filtration system alone can compete with filtration *plus* chlorination, or indeed with chlorination *per se*, provided the treatment is properly carried out. The 'anti-chlorinators' contend that the evidence in favour of the typhoid bacillus being the cause of typhoid fever is not absolutely convincing, and therefore that reliance should be placed on the old filtration processes which have hitherto enjoyed so honourable a past in controlling the spread of water-borne diseases.

"These matters are, no doubt, debatable, but the writer feels nevertheless that chlorination has a great future before it.

"For example :—

"(1) *Saving pumping charges.*—When water has to be pumped into storage reservoirs, which are required for purposes of quantity (*i.e.*, to guard against drought), it may be much cheaper when the reservoirs are full to hold them in reserve. The water on its way to the filters may be chlorinated and as good, or better, bacteriological results obtained as by storage. Alternatively the water may be chlorinated after filtration. The Water Board have saved enormous sums of money by keeping the Staines reservoirs full and chlorinating (except during floods) the water gravitating down the Staines aqueduct to feed the Kempton Park, Sunbury Grand Junction and West Middlesex filters. Coal would have to fall, or chlorine rise, to unprecedented prices before this method of treatment would cease to be economically sound. (See diagram A.)

"(2) *Adverse weather conditions.*—In the case of some water supplies good purification results are obtained under favourable weather conditions, but the reverse during periods of heavy rainfall. The use of chlorine to wipe out the imperfections during times of stress may be the means of avoiding or postponing, the construction of expensive works. The Water Board have used this method with great advantage in the case of the New River supply. Chlorination is only practised during the winter months and it prevents the deterioration in the supply, which, owing to inadequate

storage accommodation and filtration area, was characteristic of the flood months of the year. The necessity for considering the construction of extremely costly remedial works has thus been postponed, or obviated.

"(3) *Sources of supply.*—As a counsel of perfection, it is desirable to plead for the choice of virgin sources of water supply, but the success of chlorination treatment all over the world and with all classes of water has altered our outlook to a considerable extent. At the present time, chlorination treatment has led, in a number of instances, to the re-use of abandoned sources of supply, and undoubtedly the present tendency is to consider that almost any water can be rendered epidemiologically safe by its use. In effect, chlorination has greatly extended our available sources of water supply.

"(4) *Occasional uses.*—The occasional use of chlorine appears to have a bright future. Checking the deterioration of river water during floods has already been alluded to, but, as well, during periods of severe frost the increased consumption, or waste, of water usually leads to a falling-off in the results, and here again chlorination may be used as a temporary measure with great success. Further, during the hottest months of the year the consumption may rise so greatly as to lead to an appreciable deterioration in the quality of water supplied to consumers, rendering it in certain cases desirable to safeguard the public by the use of some supplementary process of purification. The prevalence of typhoid fever in England has decreased so much that it contributes only fractionally to the general death-rate and its relation (apart from epidemics) to water supply is now, generally speaking, considered somewhat doubtful. September, October and November, however, are so much the worst months that in *selected* cases chlorination of water during those months might be worth considering as an additional safeguard, even if the necessity of so doing rests on nebulous grounds. The treatment would, of course, have to take into account the incubation period (say 10–14 days) and might perhaps be extended over the whole of the four months (August to November) as an extra precaution.

"(5) *Local treatment.*—There are many waterworks where the filters are situated at so low a level that there is no means of running the filtered water to waste when a freshly cleaned bed is put into commission. This means that a new bed can, or should, only be worked very slowly for the first few days until a proper skin has been formed, and in any case the product (good, bad, or indifferent) has to be 'ingested' by the consumers. In this connection a mobile* chlorine plant would seem to have a future before it, as it could be moved to each new filter bed and the water sterilized ('unit method') either before or after† filtration for the first few days and the rate of filtration maintained at the normal speed from the very outset, thus relieving the work otherwise thrown on the remaining filters. There are, moreover, occasions when, from one or another cause, a filter bed is not yielding good results, and here the temporary use of chlorine would be of distinct advantage. Lastly, when the water lying on the top of the filter beds develops seasonally, or occasionally, excessive, or objectionable growths, these could be kept in check by the temporary use of chlorine.‡

"(6) *Economical considerations.*—If the writer had to face the prospect of saving money on new water purification works without respect to

---

* Or a stationary plant with pipe lines laid so as to command the various filters.

† If chlorination were practised *after* filtration the duration of contact in the case of old works would be so short as to call for large doses of chlorine, so large indeed as perhaps to render the "unit method" of treatment of doubtful value.

‡ This question is *now* being investigated with apparently successful results.

sentimental considerations, he would undoubtedly choose, from an epidemiological point of view, such a large decrease in the filtration area as would far more than cover the cost of a chlorination process, rather than a less drastic reduction in the filtration area and no chlorination treatment. In other words, more rapid filtration, *plus* chlorination is safer bacteriologically than a slower rate of filtration, *minus* chlorination. Apart from questions of finance one should, of course, prefer a chlorination process grafted on to a perfect filtration system.

"The writer has studied many forms of natural and artificial purification of water (*e.g.*, storage, excess lime treatment and chlorination). There is no inconsistency in exploring every avenue in the endeavour to reach the truth. Each problem of water supply ought to be judged on its own merits, and it is not illogical to vary one's conclusions according to the needs of a particular case.

"For example, in the case of a virgin moorland gathering ground, chief attention would be paid to methods which improved the colour of the water and prevented its action on metals.

"In cases where impure water has to be stored in bulk for purposes of *quantity* (*i.e.*, to guard against drought) reliance would be largely based on sedimentation and the equalizing and devitalizing effect of sustained storage to carry the water far in the direction of complete purity and safety. The writer's views on this subject expressed in 1908 remain the same in 1922, although this does not imply blindness to other methods of purifying water separately from, or in conjunction with, storage.

The excess lime method was brought forward at a time when chlorination lay under a cloud of distrust. Its chief attraction lies, perhaps, in the harmlessness of the chemical used, the absence of taste and the applicability of the method to the sterilization of very soft, but impure waters, which usually 'use up' large doses of chlorine, due to the presence of a great deal of oxidizable matter. In the case of hard waters, so much lime is required to overcome the temporary hardness that its use is not economical unless softening is the governing factor in the situation. The writer does not believe that moderately hard water is necessarily, if at all, injurious to health, and considers also that the advantages (apart from questions of incidental purification) of a softened water have been exaggerated. Nevertheless, we are the slaves of public opinion, and if sentimental or other considerations eventually decreed that London's water supply should be softened, the writer's experiments conclusively show that a hard impure water can be changed by appropriate lime treatment into a soft tasteless and absolutely innocuous product.

"The war has changed a great many things, including our tendency to allow sentiment unduly to govern expediency. Out of it, rightly or wrongly, has emerged the claims for re-consideration of the question of chlorination, which the writer first used at Lincoln, in the face of bitter opposition, as far back as 1905.

"It is not illogical to study the advantages and disadvantages (for both have been presented with equal force) of storage, liming, chlorination, slow and rapid filtration, and every other means of producing safe and potable waters. On the contrary, inconsistency lies in slavish adherence to one particular mode of purification, irrespective of totally different conditions or altered circumstances, and supporting that method by specious reasoning through thick and thin, having regard only to its alleged merits, and unconsciously, if not deliberately, ignoring all other adverse factors bearing on the situation. The purification of water is as old as the hills, but it still possesses unexhausted fields of possibilities. Chlorination may not be the ultimate goal, but it is one of the avenues which merits exploration, and even if it is regarded as only a temporary measure it may be the means of tiding us safely, as well as economically, through a period of unparalleled financial stringency.

Methods of Administering Chlorine to Water.

"The writer receives so many queries as to the best methods of administering chlorine to water, that the following brief notes may prove to be of value :—

"*Gaseous.*—The chlorine gas is liquefied under pressure, and is contained in steel cylinders possessing specially contrived exit valves and the gas being in the anhydrous state does not act on the metal. The problem is to bring the chemical into final relation with the water to be treated in such a way as to secure uniformity of dose. As the pressure of the gas varies with the temperature, it is necessary to reduce it to a constant, which is independent of all normal atmospheric variations of temperature (say, from 80 to 25 lbs. on the square inch). This reduction of pressure is produced by the use of a patent reducing valve, or valves, and without going into any description of their merits, or the principles controlling their action, it may be said that in effect they satisfactorily achieve their object. The gas thus leaves the cylinders through copper tubes under a high but varying pressure, and emerges from the reducing valves under a constant pressure, but in volume, and therefore in sterilizing power, susceptible of control by what practically amounts to a tap, or a gas valve, capable of being controlled at will. Obviously, however, there must be some method of measuring how far a turn of the controlling gas valve corresponds with an increase or decrease of the volume of gas delivered from the apparatus. This is effected in two chief ways, either by allowing the gas to displace sulphuric acid or some other suitable liquid in a syphon U tube, the number of ' pulses ' being correlated with the volume, and therefore the weight of gas escaping, or by allowing the gas to pass through an orifice of fixed size, the difference of pressure on the two sides of the orifice being measured by means of a manometer. As this difference of pressure varies according to the rate at which the gas passes, a scale may be constructed either by calculation (knowing the size of the orifice and the physical constants of the gas), or by direct experiment, whereby the rate at which the gas is passing may be read off. It then only remains to know the rate of flow of the water to be treated, and the control valve is adjusted to give the requisite dose of chlorine.

"Next comes the delivery of the gas to the water to be treated, either as a gas, or after its preliminary solution in water.

"As regards the former, ingenious devices exist for passing the gas through porous plates, bulbs or cylinders of some carborundum-like material immersed in the water, the gas escaping into the water in the form of infinitely small bubbles, or possibly as a sort of ' chlorine sweat.'

"The writer has had some experience in the past of this method, and although it worked admirably when the water to be treated was not too cold, it failed lamentably under less favourable climatic conditions, owing to the formation of a solid hydrate of chlorine which choked the pores of the diffusers. Since then, the writer understands that great improvements have been effected, but the much safer method of dissolving the chlorine gas in water by appropriate means and delivering it as a solution is to be preferred. For example, the gas may be allowed to escape into a glazed earthenware tower containing pieces of the same material and water allowed to trickle through it continuously, thus dissolving the gas and producing a perfect solution of chlorine, which is allowed to flow out of the tower through a hard rubber pipe into the water to be treated. The volume of water used is immaterial provided solution is complete, but the error should be largely on the side of excess, as in this way more perfect final mixing is obtained. In the anhydrous state chlorine does not act on metals, it is only after contact with water that its intense corrosive action is manifested. In the presence of water the use of materials such as glass, earthenware, porcelain, hard rubber, etc., are essential. It is most desirable that the mixture of the solution of chlorine and the water to be treated should be as rapid and as perfect as is reasonably practicable.

In the case of an open aqueduct a perforated pipe across the aqueduct, some two or three feet below the surface, seems to be fairly effective, but some form of baffle or sluice immediately below the point of application very materially assists in obtaining complete mixing. Far too little attention is paid to this highly important point of perfect mixing, as the success of the treatment may hang on this very circumstance. The Paterson Engineering Company, Limited, and the United Water Softeners, Limited, supply apparatus for chlorinating water successfully by means of liquid chlorine, and the writer has had ample opportunities of testing practically the value of their instruments. The apparatus (Wallace and Tiernan patents) used by the latter firm can also be used for de-chlorinating water by means of liquefied sulphurous acid gas.

"*Liquid.*—Various solutions of chlorine prepared electrolytically may be used, but the writer has had most experience with the alkaline hypochlorite solution containing about 12–14 per cent. of available chlorine, prepared by the United Alkali Company and sold under the trade name of 'Chloros.' The writer used this substance most successfully as far back as 1905 at Lincoln in connection with the typhoid epidemic there. In emergencies there is a great and obvious convenience in having a sterilizing agent in a liquid form. If it could be produced and delivered at waterworks at a price in terms of available chlorine more nearly corresponding to bleaching powder, or liquid chlorine, its sphere of usefulness would be greatly extended. Chloride of lime and liquid chlorine are close competitors in the matter of price. Chloride of lime containing about 33 per cent. of available chlorine costs £16 6s. 8d. a ton, or 5½d. per lb. of available chlorine. Liquid chlorine is, of course, of 100 per cent. strength, and it costs about 4d. per lb. If chloros contained 14 per cent. of available chlorine, its price per 0·1 gallon (= 1 lb.) would, assuming approximately equal costs as regards carriage, etc., have to come down seemingly to about ¾d. to compete commercially with, say, chloride of lime.

"*Solid.*—Chloride of lime (bleaching powder) contains about 33 per cent. of available chlorine and is added to water as a solution. Previous to its use at Staines in May, 1916, a large number of experiments were carried out in the laboratory to discover the best way of mixing it with water, the depth of sludge produced, the volume of water required for the primary and secondary mixing operations, and other details connected with the production of a bleach solution of a convenient strength. These preliminary procedures were very important, as chloride of lime does not mix at all readily with water, and unless the operation is carried out on scientific lines, the solution obtained is not clear and there is loss of available chlorine and therefore waste of money. The investigations of the Staff of the Water Examination Department were so successful that the type of plant chosen for use in 1916 is practically the same as the writer recommends for employment in 1922. It has the great advantage that all the parts can be bought in the open market at a moment's notice, and the constructional work is of a simple nature.

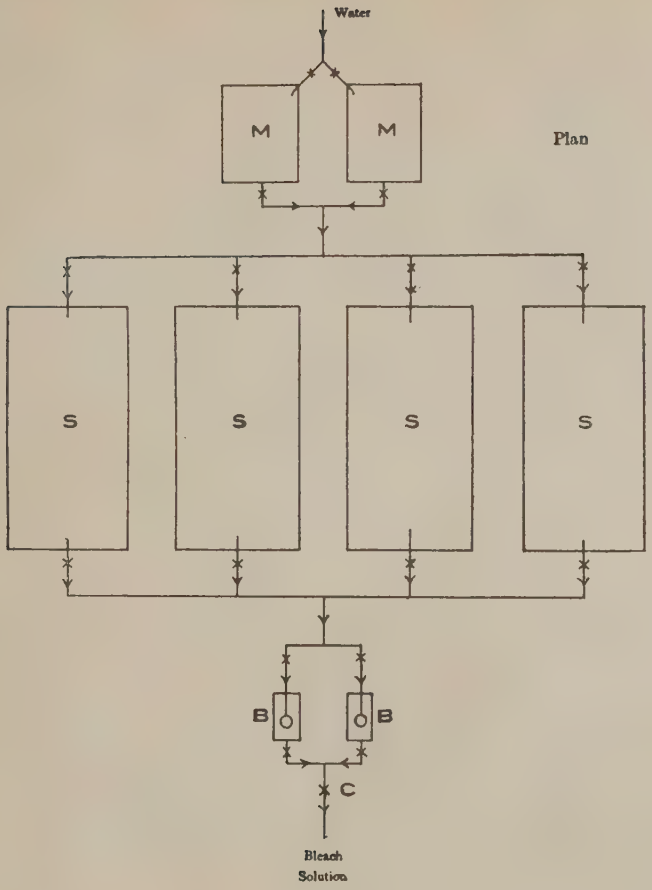
"The essential features of the apparatus* may be described and illustrated [see Fig. 13] as follows:—

"The apparatus consists of two mixing tanks (M) of about 150 gallons capacity, two or more storage tanks (S) of 1,000 gallons capacity and two balancing tanks (B) capable of holding about 20 gallons. These tanks can be of galvanized iron, but must be painted with some resistant paint, such as Bitumastic, to prevent corrosion—indeed all parts of the apparatus coming into contact with the bleach solution should be similarly treated. The tanks, etc., must, of course, be arranged at such levels as to allow the liquids contained in them to flow by gravity to the point of treatment.

"The outlet (O) of the mixing tanks consists of a 2-inch elbow looking upwards inside the tank connected through the wall of the tank to a 2-inch

---

* Briefly described in the writer's Twelfth Research Report (p. 16), 1916.



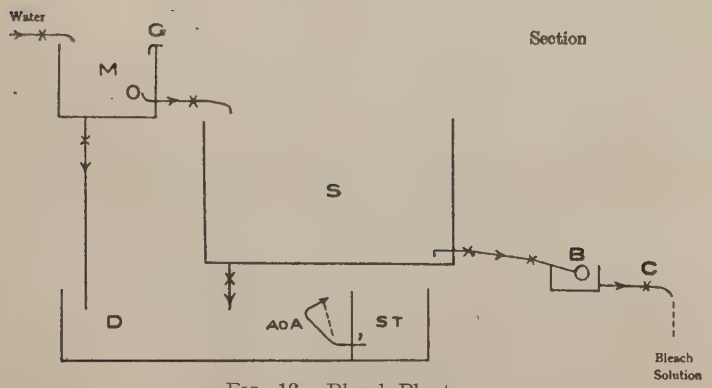


FIG. 13.—Bleach Plant.

(Diagrammatic and purposely not drawn to scale.)

[Reproduced from the *Metropolitan Water Board, Sixteenth Ann. Rep. of the Chem. and Bact. Examination of the London Waters for the Twelve Months ended 31st March 1922.*]

pipe. The top of the elbow should be at such a height from the bottom of the tank as to allow some 60 gallons to remain in the tank when run off; further, a gauge mark (G) should be fixed near the top of the tanks, so that exactly 75 gallons are contained between the gauge mark and the level of the outlet.

"The outlets of the two mixing tanks are connected and the common outlet pipe continued, so as to deliver into any one of the storage tanks. The outlets of the storage tanks consist of 2-inch elbows looking *down*, so that the bottom of the elbow is about 2 inches from the bottom of the tanks. Each outlet is fitted with a valve and is connected with a common pipe conveying the solution to one or other of the two balancing tanks, which are fitted with ball-valves to maintain a constant head on the control valve (C).

"All the valves are full-way gate-valves and the pipes up to the balancing tanks are of 2-inch diameter—the delivery pipe from the latter if short is ½-inch diameter and the control valve a ½-inch full-way gate-valve.

"The above arrangements are the direct outcome of experiments carried out on a small scale in the laboratory in the early part of 1916 to discover what was the best way of mixing chloride of lime with water, so as to produce a clear bleach solution without loss of more than traces of available chlorine.

"Both the mixing tanks and storage tanks have sludge outlets delivering into the sludge pit (D). The supernatant liquid from the settled sludge can be drawn off by means of an 'adjustable outlet arm' (A O A) into another smaller tank (S T), whence it may be pumped up to the mixing tanks and used again for mixing. This allows of the last traces of available chlorine being utilized for sterilization purposes and also assists in the final disposal of the sludge.

"The process of mixing is as follows:—One-eighth part of the total amount of chloride of lime is weighed out in pails and put into one of the mixing tanks, which has previously been partially filled with water, or with the sludge liquor from a previous mixing. The tank is then filled to the gauge mark with water and the contents well stirred and pounded (this is very important), and then allowed to settle for about ½ to ¾ hour. Meanwhile, the second mixing tank is similarly charged. When the sludge has settled in the first tank, the liquid is run off into one of the storage tanks, a second charge of chloride of lime is added and the tank filled with water to the mark and again allowed to settle. When each tank has been charged and run off 4 times, they are filled up, settled and run off twice with water only, the object being to wash as much as possible of the available chlorine from the sludge.

"It will thus be seen that twelve charges of 75 gallons each, making 900 gallons in all, have been run into the storage tank, and the liquid after being thoroughly stirred is analysed chemically to ascertain the amount of available chlorine actually present, and knowing the rate of flow of the water being treated, it is easy to calculate the rate at which the solution is to be run into the water for any particular dose. The rate of addition of the solution is measured by determining the number of seconds required to fill a quart measure, and as the number of seconds in one hour is the same as the number of quarts in 900 gallons, the rate of addition of the solution in seconds per quart is also the number of hours the tank will last. The storage tanks are usually mixed with sufficient chloride of lime to last separately for one day, and the amount in lbs. can be arrived at by multiplying the dose (parts of av. cl. per million parts of water) by 30 (assuming the chloride of lime to contain 33 per cent. of av. cl.) and the product by the number of million gallons of water to be treated per 24 hours. It is advisable (if not absolutely necessary) to determine by analysis the actual amount of chlorine present, and adjust the rate of addition of the solution accordingly.

"This can be arrived at by the formula

$$R = \frac{216\,S}{F\,D}$$

where R = rate of flow of solution in secs. per quart.
S = per cent. available chlorine in solution.
F = rate of flow of water treated in m.g. per day.
D = dose in parts available chlorine per million.

"When the mixing is complete, the sludge remaining in the mixing tanks is run off into the sludge pit and the tank made ready for the next day's mixing.

"It is found that a certain amount of fine sludge collects in the storage tanks, but it is only necessary to run this off into the sludge pit occasionally (say, once a month).

"The plant described is capable of treating 25 to 50 million gallons per day, with a dose of 0·3 (or less) to 0·8 parts chlorine per million, and, of course, by working the storage tanks more rapidly, say, 2 per day, still larger amounts can be treated. For smaller amounts smaller tanks may be used, or the 1,000 gallon tanks made to last 2 days, but it is found in practice to be difficult to maintain a steady flow with a less rate than, say, 1 quart per minute, owing to the smallness of the aperture in the nearly closed control valve. With such low rates, a soft lead nozzle fixed to the control valve, which can be easily expanded or contracted to give approximately the correct rate, is found to be a great advantage, the control valve being used as a fine adjustment.

"It has been proved that if the storage tanks are covered the solution will maintain its strength for a much longer period than if left uncovered.

"The mixing of chloride of lime with water so as to produce a clear bleach solution, without appreciable loss of available chlorine, is not a pleasant task, and the plant doubtless presents an unsightly appearance, but if all the operations are carried out in the exact manner here described, the method is almost 'fool-proof' and is extremely cheap, almost exactly thirty-three per cent. of chlorine (*i.e.*, practically all that is available) being extracted from the material. This is a striking example of the way laboratory experiments on a small scale may sometimes enable a large plant to be designed and installed without previous practical trials on a big scale, and yet fulfil all essential requirements, a result which otherwise could only have been reached by perhaps one or more preliminary failures."

HOWARD (Norman J.). **Chlorination of Water Prior to Filtration.**—*Surveyor & Municipal & County Engineer.* 1922. Oct. 27. Vol. 62. No. 1606. pp. 255–256.

——. **Water Treatment. Modern Practice in the Removal of Taste and Odour.**—*Ibid.* Nov. 3. No. 1607. pp. 275–277.

These papers may conveniently be taken together; they are both of great importance to the water bacteriologist.

The first deals with the treatment of the town supply of Ontario by the addition of chlorine prior to filtration. The circumstances under which this is necessary are as follows. The intake on Lake Ontario is situated on an island where the filtration plant of mechanical filters is also located. The plant is known as the "drifting sand system" of purification, details of which are not given in the paper and are not widely known in this country.

The plant was designed to work with alum at the rate of 1 grain per gallon, but the pollution of the raw water increased so rapidly that not infrequently 2·5 grains per gallon had to be added to obtain a suitable filtrate. The cost of treating 50 million gallons of water

with this quantity of alum is very great. The water, generally speaking, is not a muddy water.

The water after filtration passes down a tunnel and under the river and is pumped into the town, where, on account of leakage into the system, chlorination is again carried out. As the writer says, the practice of applying chlorine both before and after filtration is not an appealing one, but the abnormal conditions prevailing in Toronto during the warm weather, when the pumping rate exceeded 100,000,000 imperial gallons, have more than justified the action of the city.

The objection to adding chlorine at this rate is the risk of obtaining a taste in the final water. The amount of chlorine added appears to have been 0·225 parts per million gallons. This, as the figures show, was sufficient to kill by far the majority of faecal organisms and did not give rise to any serious taste.

"For the purpose of comparison the average of all results and the purification effected by alum and chlorine separately are given below.

TABLE 1.

Bacteria growing on agar at 37° to 39° C., 24 hours' incubation, showing the yearly average number per cubic centimetre in raw and filtered water and the total percentage reduction in the filtered water for the year.

Yearly average. Raw water.	Filtered water.	Percentage reduction.
All results included :—		
566·37	26·29	95·2
When alum alone was being applied :—		
707·16	44·94	93·6
When chlorine but not alum was being applied :—		
504·99	18·12	96·3

TABLE 2.

Excremental bacteria growing on bile-salt agar (Rebipelagar) at 37° to 39° C., 24 hours' incubation, showing the yearly average number per cubic centimetre, in raw and filtered water and the total percentage in the filtered water for the year.

Yearly average. Raw water.	Filtered water.	Percentage reduction.
All results included :—		
21·70	1·28	93·8
When alum alone was being applied :—		
36·03	3·21	91·1
When chlorine but not alum was being applied :—		
15·45	0·44	96·9

TABLE 3.

Indicated number of B. coli *per* 1 *cc. in raw and filtered water and the total percentage reduction in the filtered water for the year.*

Yearly average. Raw water.	Filtered water.	Percentage reduction.
All results included :—		
725·39	1·68	99·8
When alum alone was being applied :—		
1,168·85	3·89	99·6
When chlorine but not alum was being applied :—		
570·80	0·71	99·9

TABLE 4.

1920.		1921.	
Alum used, 1,219·26 tons	$60,963·00	Alum used, 363·1 tons	$18,155·00
Chlorine	—	Chlorine, 9·373 tons	2,343·37
Additional labour	—	Additional labour	5,975·32
Total	$60,963·00	Total	$26,473·69

Note.—Alumina sulphate cost $50 per ton delivered to the plant in 1920–21. Chlorine in 1921 cost $250 per ton. Additional labour included three men working whole time and one relief man two days weekly.

Total expended in chemicals, 1920	$60,963·00
Total expended in chemicals, 1921	26,473·69
Nett saving	$34,489·31

"The average dose of applied alum in 1920 was 1·219 grains per Imperial gallon, while in 1921 it was 1·30 grains. During 1921 the average amount of water filtered through the drifting sand plant was slightly lower than in 1920. This latter difference was balanced by the increased dosage of alum during the past year.

"By utilising the services of the chlorine operators on the plant during such times as the chlorine was not being applied, and by saving in pumpage and backwash water, etc., the superintendent of the plant has estimated a further saving of $5,000 during the year 1921, making a total saving of $39,489·31."

"From the foregoing facts and figures presented it will be seen that where conditions are suitable chlorination prior to mechanical filtration is a sound and economical method of operation, the advantages claimed being: (1) purer water obtained; (2) great economy effected; (3) operation of plant generally facilitated; (4) increased rate of filtration possible; (5) probable removal of chlorine taste."

* * * * * * * *

The second article deals with the subject of taste in water caused by minute plants and by the use of chlorine as a sterilizing agent. The paper is one that should certainly be in the hands of all water bacteriologists and engineers.

Unfortunately we can only give a comparatively brief résumé.

After alluding to the taste caused by iron, the writer goes on to that caused by microscopic organisms, particularly the lower forms

of plants. This taste is usually brought about by their rapid multiplication and death and the freeing of oils which are elaborated in the body of the plant itself. Thus Crenothrix in a water containing iron certainly gives rise to taste. Aeration following filtration will, however, usually remove it.

The writer quotes the work of HOUSTON, pointing out that some of this taste is rapidly removed by the addition of $2\frac{1}{2}$ to 5 lb. of permanganate of potash per million gallons. BRUSH and HALE showed that copper sulphate was successful in killing large numbers of organisms, including Tabellaria, Asterionella and Synura. The last of these adds a very unpleasant cucumber-like odour to water, due to the oil manufactured in the body of the plant. Addition of chlorine removes the taste, but it takes a large quantity, something between 0·3 and 0·73 parts per million gallons, and the action is apparently slow. It is, however, recommended by the writer that the organisms be first killed with copper sulphate and the taste removed with excess chlorine afterwards.

The writer then refers to the work by HANNAN, who points out that several algae appear to depend on alkalinity of the water; if acid was added to the water so as to neutralize a portion of this alkalinity, the numbers decreased. This, however, is not confirmed by HOUSTON in this country. He considers that the effect of adding acid is only slight.

As to the taste and odour caused by chlorine in water, it is now well known that there are two different tastes which have to be guarded against: one, the ordinary chlorine taste, and the other known as iodoform or chemist shop taste.

As regards the latter, a great deal of work done by the writer shows that the cause is partly, if not wholly, the fact that the water contains phenol compounds due to trade waste.

"When working in the Toronto laboratories using Lake Ontario water, we have been able to establish the definite dosage of chlorine and phenol, which combines and forms the iodoform taste. The chief point established is that the critical figure which causes taste is close to the actual dose of chlorine applied in many cities, thus explaining why it so often occurs. . . .

"The extensive nature of the figures makes a summary difficult. Briefly it may be stated that applied chlorine in doses up to 0·1 p.p.m. does not produce taste in combination with phenol, when this latter substance is present in quantities up to 0·015 p.p.m. Doubtful tastes may occur when chlorine is added in amounts between 0·135 and 0·150 part with phenol present up to 0·015 p.p.m. The critical dosage range occurs when chlorine is added in amounts between 0·175 and 0·4 p.p.m., with phenol ranging between 0·002 and 0·017 p.p.m. An actual combination of 0·22 part of chlorine and 0·007 part of phenol caused a water which both tasted and smelt badly of iodoform. In most of the experiments the taste, when it had once developed, became steadily worse and in one instance after ten days was still pronounced. Chlorine applied in doses in excess of 0·65 part per million completely eliminated the iodoform taste when phenol was present up to 0·017 p.p.m., but a faint chlorinous taste was left.

"In this series of experiments, involving several hundred tests, two definite points were established; first, that, in the presence of small amounts of phenol, an iodoform taste developed when 0·175 p.p.m. of chlorine was added, and second, the taste persisted until

the amount of applied chlorine reached a dosage of 0·65 p.p.m. Having demonstrated that chlorine in excess would take out the iodoform taste, experiments were made to see if increased doses of phenol would act in a similar manner. Chlorinated water containing 0·2 part of chlorine was treated with phenol in doses ranging between 0·010 and 0·064 p.p.m. The water thus treated was almost undrinkable, both tasting and smelling of iodoform."

Excess lime was also tried to remove this iodoform taste, but it apparently was not very satisfactory; it appears only to mask the taste and not definitely to remove it.

In conclusion the writer is strongly of the opinion that industrial wastes are actually the cause of the taste occurring in chlorinated water. The best and surest remedy would be prevention of stream pollution.

Aumonier (F. S.) & Elliott (S.). **Note on Stabilized Bleaching Powder for Tropical Use.**—*Jl. Roy. Army Med. Corps.* 1922. Dec. Vol. 39. No. 6. pp. 459–460.

This paper is of considerable importance to tropical sanitarians; it deals with the work of Messrs. Rettie, Smith and Ritchie, published in the *Journal of the Society of Chemical Industry*, No. 23, 1918, pp. 311 T. and 392 R.

If 20 per cent. of dry quicklime is added to ordinary chlorinated lime or bleaching powder the mixture remains dry and powdery in hot climates; it does not corrode the tins and only loses a very small proportion of its available chlorine when exposed to the atmosphere.

It appears that in ordinary bleaching powder there is always a slight excess of water; when quicklime is mixed with it the water is taken up and the heat produced thereby slowly dissipates, but does not raise the temperature so high as to decompose the chlorine compound. After the dehydration process the mixture is stable even in tropical countries.

The experiments show that the powder lost no chlorine when subjected to moist heat at a temperature of 50° C. for several weeks.

An open tin in the laboratory at 60° F. only lost 0·45 per cent. of available chlorine in nine weeks.

A heap of the powder exposed for three weeks in the laboratory lost 16·2 per cent. of available chlorine in the outer layer ($\frac{1}{4}$ in. thick) of the heap and in the interior only 1·6 per cent. In a control experiment done with ordinary bleaching powder the initial content of 35 per cent. fell to 4·9 per cent. under the same conditions.

At the end of a year tins which had been in hot climates showed that the powder was in good condition, dry and not caked; there was no internal rusting nor corrosion of the tins; the available chlorine content varied from 23·6 to 24·8 per cent.

The available chlorine in the mixture is 25 per cent.

Wood (Cyrus B.). **A Survey of Calcium Hypochlorite (Bleaching Powder) Tubes for Use with the Lyster Water Bag.**—*Milit. Surgeon.* 1922. Oct. Vol. 51. No. 4. pp. 444–450.

The writer reports the experience obtained during the war of packing bleaching powder in sealed glass capsules (each containing 1 gm. of the powder) for use in the sterilization of water for the army in the field.

Notwithstanding that they were packed (in boxes of 60) in layers (of 12 each) protected with corrugated paper, from 22 to 37 per cent. were cracked or broken and the contents spoilt. The chemical condition of the contents of unbroken tubes, many of which were from 16 to 28 months old, was investigated, and the average rate of deterioration was found to be about 0·5 per cent. per month, but higher in hot stations.

HUTCHINSON (C. M.). **A Comparison of E.C., Bleach and Chlorogen.**—*Indian Med. Gaz.* 1922. Oct. Vol. 57. No. 10. pp. 365–366.
MACWORTH (N. W.), with Note by LAHA (S. B.). **Electrolytic Chlorogen.**—*Ibid* pp. 361–365.

The first of these articles gives a description of the method of making a hypochlorite solution from brine. We have already reviewed an article on this subject in Supplement No. 3, 1922, and little need be added. The strength recommended is about 2 to 2·5 per cent. of available chlorine and the cost is about 4 annas per gallon. This, of course, is ridiculously cheap as compared with all proprietary solutions, such as chlorogen, which is Rs.2 per gallon.

As the writer points out, it can be greatly diluted for such purposes as disinfecting vessels, drains, etc. All hospitals that have installed this plant save considerably on their bill for other disinfectants. Actually in Muzaffarpur Rs.1,500 per annum was saved.

The second article deals with the uses of hypochlorite solution in general hospitals. This is well known to all surgeons, particularly to those who used it during the war. Col. Macworth finds that it is extremely satisfactory for treating sloughing ulcers and septic wounds and possesses many advantages over carbolic and perchloride of mercury.

LOTHIAN (N. V.) & WARD (A. R.). **The Action of Chlorinated Water on Galvanized-Iron Tanks.**—*Jl. Roy. Army Med. Corps.* 1922. Sept. Vol. 39. No. 3. pp. 163–170.

The writers deal with an interesting practical problem, namely, the solvency of zinc from a galvanized iron tank both in raw waters and in waters that have been chlorinated for drinking purposes.

As is well known zinc has not infrequently been found in solution in certain types of raw waters, particularly soft waters and those coming from peaty soils, when stored in galvanized iron tanks. Waters of a certain temporary hardness, however, rapidly coat the inside of the tank with an insoluble zinc carbonate.

During the war several waters used behind the lines were found to dissolve zinc, particularly that at Etaples. The amount of zinc depends on the length of time that the water remains in the tank; at Etaples water was found to contain 0·35 gr. after 1 day and 0·42 gr. after 2 days. The action of chlorinated water on new tanks is much more rapid than on older tanks.

The writers say that as long as free chlorine can be detected in the water the amount of zinc is not appreciable. With the disappearance of free chlorine there is definite increase both of zinc and of alkalinity, until it reaches a concentration of six parts per million (0·42 gr. per gallon) the zinc remains in solution; at between six and ten parts per million (0·42 to 0·7 gr. per gallon) turbidity appears; at and above the latter quantity the zinc is precipitated as a dirty grey

flocculent deposit of hydrate, with traces of the carbonate, and is found at the bottom of the tank. The amount of zinc taken up appears to vary with the hydrogen-ion concentration.

" We are therefore inclined to regard the hydrogen-ion concentration of the water as of first interest. Mere increase of the alkalinity (as ordinarily understood) does not appear to hinder the zinc-solvent action at all, as is evident from the following figures. In these tests, conducted out of doors to avoid absorption of laboratory ammonia and in new tanks, plain tap water only was used ; the results were :—

——	After storage of	Grains zinc per gall.	Parts per million.	P_H.	Alkalinity (as $CaCO_3$) to methyl orange.
Tank with plain water	(at once)	—	—	6·85	5·6
	6 hrs.	0·27	3·9	7·1	6·2
	24 ,,	0·37	5·3	7·5	8·4
	72 ,,	0·95	13·6	7·6	13·6*
Tanks with plain water, plus 2 parts per million CaO	(at once)	—	—	7·8	7·0
	6 hrs.	0·33	4·8	7·7	7·6
	24 ,,	0·44	6·3	7·8	9·1
	72 ,,	1·42	20·4	7·8	16·8

* It will be noted how the alkalinity increases with the zinc.

The writer gives some of the effects of zinc on the body. As regards the best method of preventing tanks contaminating water with the metal, it has been found that the " Bitumastic Solution," of Messrs. Wailes, Dove and Co., Ltd., gives the best protection. Whitewashing tanks with lime answers satisfactorily for a short time.

Another interesting point about the tanks treated with the above solution is that they apparently retain their free chlorine longer than untreated tanks ; consequently less may be required for sterilization.

The inside of a water cart can be protected for about 1*s.* and a 400-gal. tank for about 2*s.* These prices, however, were for the year 1920, and very likely they have decreased since that date.

KELLERMAN (K. F.). **Algal Growths in Water Supplies.** [Correspondence.]—*Surveyor & Municipal & County Engineer.* 1922. Oct. 27. Vol. 62. No. 1606. p. 261.

" Copper sulphate . . . should be used as an emergency treatment for eradicating odour-producing algae. For the convenience of those who wish to superintend personally the treatment of water for the removing of algal pollutions, I have prepared tables showing the quantity of copper sulphate required to eradicate the more common forms, and also the concentration beyond which copper sulphate may be dangerous for several kinds of fish."

TABLE 1.

Showing quantity of copper sulphate required to kill various forms of odour-producing organisms.

Copper sulphate expressed as parts per million galls.

Anabaena	0·09	Kirchneriella	5·00–10
Asterionella	0·10	Leptomitus	0·40
Beggiatoa	5·00	Microspora	0·40
Chara	0·20–5	Navicula	0·70
Cladophora	1·00	Oscillatoria	0·10–0·40
Cladothrix	0·20	Peridinium	2·00
Clathrocystis	0·10	Scenedesmus	5·00–10
Coelosphaeruim	0·30	Spirogyra	0·05–0·30
Conferva	0·40–2	Ulothrix	0·20
Crenothrix	0·30	Uroglena	0·05
Euglena	1·00	Volvox	0·25
Fragilaria	0·25	Zygnema	0·70
Hydrodictyon	0·10		

TABLE 2.

Showing occurrence of twelve genera of algae most frequently reported as causing trouble in reservoirs and ponds.

	No. of cases.		No. of cases.
Anabaena	27	Conferva	56
Asterionella	9	Crenothrix	13
Beggiatoa	20	Fragilaria	19
Chara	26	Navicula	21
Cladophora	17	Oscillatoria	49
Clathrocystis	23	Spirogyra	43

TABLE 3.

Showing safe limit for treating water with copper sulphate when certain fish are present.

Copper sulphate expressed as parts per million galls.

Black bass	2·10	Pickerel	0·40
Carp	0·30	Suckers	0·30
Catfish	0·40	Sunfish	1·20
Goldfish	0·50	Trout	0·14
Perch	0·75		

GORMON (Arthur E.). **Supplying Drinking Water on Trains Operating in Inter-state Traffic. Sanitary Conditions under which Drinking Water is being supplied on Trains Operating in Inter-state Traffic, at the Railroad Coach Yards in Chicago and Other Terminal Cities.** —*Public Health Rep.* 1922. June 16. Vol. 37. No. 24. pp. 1458–1466. With 5 plates.

This is an extremely interesting paper on a subject which should receive much more attention than it does at present.

The reviewer is aware of many instances of gross carelessness on the part of railway companies in India in the supply of water in lavatories and presumably dining cars on trains.

Although the conditions of travelling in America and the tropics are not necessarily similar, the care exercised in the supervision of water supplies in America is a feature of railway administration that requires much more careful attention in the east.

FIG. 14.—Section of "through" coach yard with plank walks. When steam lines are laid under these wooden walks, rats nest under them in winter. Note that hydrants are so located that pollution by toilet wastes from cars is possible.

FIG. 15.—Section of coach yard, showing concrete walks and drain gutters. Note hose lying on walk in the distance.

[Reproduced from *Public Health Reports.*]

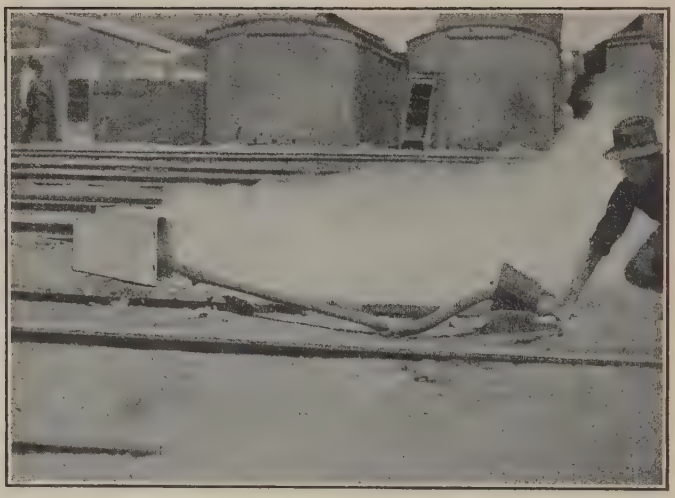


FIG. 16.—A common method used in coach yards for "sterilizing" water coolers by steam. When not in use the hose lies on the ground exposed to filth. Coolers are frequently contaminated by such practices.

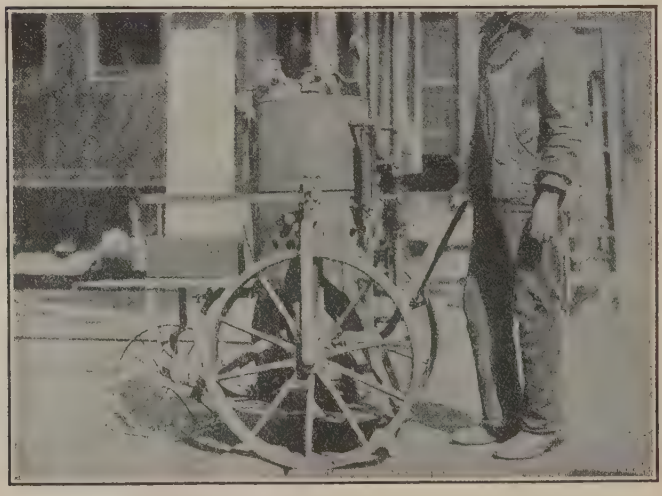


FIG. 17.—Portable boiler and steam sterilizer used by the Pullman Company. Note inverted water cooler in position for steaming.

[Reproduced from *Public Health Reports*.]

The writer points out that the regulations concerning water are laid down in sections 19–23 of the Inter-State Quarantine Regulations of the U.S., May, 1921. They require that the supply for drinking and culinary purposes shall be obtained from an approved and certified source, forbid the use of common drinking-cups, and require that the water shall be cooled in such a manner that the ice shall not come in contact with it.

The writer then describes his various inspections of stations where the drinking supplies are replenished. He considers that on the whole the work was done conscientiously and in a sanitary manner by most companies. There were, however, certain defects which should be remedied. Concerning the source of drinking water, the majority of companies had properly protected and satisfactory supplies laid on at the coach-yard. The arrangements for filling tanks and for sterilizing and re-filling the ice coolers were capable of improvement, in his opinion.

As will be seen by some of the illustrations, the hydrants are situated between the rails and in order to fill the tanks it is necessary to make use of a flexible hose. The main trouble appears to be that the closet accommodation of the coaches is cleansed in the same yard ; consequently the ground is liable to be fouled to some extent by human dejecta.

It is easy to see that the dragging of a flexible hose across unclean ground is open to serious objection ; the end becomes frayed unless, as suggested by the author, it has a strong iron nozzle with cut off taps heavily coated with nickel attached. The author also suggests putting loops, either of leather or rope, on the end of the pipe, about 10 in. in length, so that the attendant may carry the hose or sling it over his shoulder rather than drag it about the yard.

The water coolers are sterilized with live steam blown into a receptacle for quite a minute and a half. The best method is to put the vessel on a table and apply the nozzle of the steam pipe, after which the receptacles, which are cleaned out every week, may be looked upon as certainly sterile.

The handling of ice requires a certain amount of care from a sanitary point of view. It is carried about on a flat trolley and is smashed by a pickaxe and dropped into the cooling chamber of the water tanks. The ice should be clean and may be rendered so by turning the steam jet on it for a few seconds.

In conclusion the author points out that standardization of all plants and methods is most desirable on all American railways. The illustrations give a good idea of the working conditions in America.

We consider that it is very desirable that all sanitary officers on railway work should obtain copies of this paper.

Gorman (Arthur E.). **Control of Drinking and Culinary Water on Vessels in Inter-state Traffic. The Supervision and Control of Water provided for Drinking and Culinary Purposes on Vessels operating in Inter-state Traffic on the Great Lakes and Ohio River during the Navigation Season of 1921, as exercised by the United States Public Health Service in Co-operation with State and Local Authorities.**—*Public Health Rep.* 1922. June 30. Vol. 37. No. 26. pp. 1573–1580.

This paper deals with water supply of lake and river steamers. The regulations of the Treasury Department Circular No. 240, March 3,

1921, provide that vessels operating in inter-state traffic or between ports on or near the U.S. or in the U.S., must either obtain their water supply from approved sources ashore or treat the water on board by approved methods.

In most of the river craft the water is taken from good supplies on the river banks, but in the Great Lakes it is frequently taken during the voyage. The regulations also provide that no unpurified water shall be allowed in the galley or ship s quarters. If use is made of unpurified water, notice to the effect that it is not to be used for drinking purposes must be shown. Also there must be no by-pass or pipe connexions between the purified and the unpurified water supply. No lead pipes are to be used in the drinking water supply ; all water coolers must keep the ice entirely apart from the water.

The usual methods of purifying the water are filtration and the ultra-violet ray disinfection, heating by steam, filtration and ozone treatment and distillation. All of these worked quite well with the exception of the ozone plant, which has not given good results under the conditions on board ship. The ultra-violet ray plant combined with filtration has been satisfactory. Arrangements have been made to take samples of water on board ships for bacteriological analysis, and the usual total colony count on agar and the presence of lactose-fermentation in 10 cc. are used as standard tests. From a large quantity of work done on these lines it would appear that most of the vessels have fairly satisfactory drinking water on board.

Raju (V. Govinda). **Certain Limitations of the *Bacillus coli* Method in Water Examinations.**—*Jl. of Hyg.* 1922. Nov. Vol. 21. No. 2. pp. 130–133.

This paper is of considerable importance to all interested in water analysis in tropical countries. It cannot be better reviewed than by giving the author's summary and conclusions.

"Contradictory opinions are at present held on the subject of bacterial standards of purity of water in India. My recent researches tend to throw some light on some of the causes of this divergence of opinion. The presence of frogs in water has been found to be responsible for an increase in faecal bacilli which, though negligible in the case of large bodies of water, is apt to be misleading in the case of waters of great purity. Stasis in reservoirs and passage through pipes may be responsible for a considerable increase in faecal bacilli in water, so that a mere increase in the number of faecal bacilli in a reservoir or pipe water does not necessarily indicate faecal contamination. . . . These findings lead to two conclusions of importance in regard to the bacteriological examination of water : (1) in testing for the bacterial efficiency of sand filters, samples should be collected from the filter well and not from the clear water reservoir where water is usually stagnant for some hours ; (2) in interpreting the results of the examination of pipe waters the possibility of an increase of *B. coli* having occurred through multiplication in the pipes should always be borne in mind before inferring that such increase is indicative of faecal contamination or leakage in the mains."

With all the above conclusions we are in entire agreement. In nearly all cases where doubt has been thrown on the efficacy of the

coli standard for water analysis it has been shown that some contamination, either by leaky pipes or by animals, such as frogs, accounts for the increase in the number of organisms per cc. Personally we doubt whether the multiplication in reservoirs ever leads to the increase in faecal bacteria in water. The author gives an incident in the course of his paper which he considers has definitely proved this ; it is, however, very difficult to eliminate the fact of sedimentation of bacteria in a reservoir or tank.

An incident of this kind occurred to the reviewer. In a pipe line in a town where there were considerable undulations in the ground a hydrant at the bottom of a dip always gave a very much worse water than one situated at the top of the hills. This was probably not due to multiplication of bacteria, but to accumulation of those present in the water by sedimentation in the dip. Whilst multiplication does occasionally take place, it is extremely difficult to be quite sure that sedimentation may not explain the whole phenomenon.

As regards water passed through pipes the work by Delepine has frequently been confirmed, showing that water flowing through clean iron and steel pipes at a certain rate loses its faecal bacteria slowly ; the word "clean" is, however, of great importance. In the pipe that has a layer of silt in the bottom organisms will multiply very quickly ; but in supplies in tropical countries where an unfiltered water has been passed through a pipe system the results obtained from hydrants are nearly always much inferior to those at the head works. So much is this the case that we recommend never to give an opinion on a sample of water that has been drawn from a pipe main without comparing it with a sample obtained from the waterworks.

The necessity for this precaution was shown by Colonel Liston's work on the Bombay water. A series of samples was taken from the laboratory tap at Parel ; all these gave a high bacteriological count and did not show any great improvement in the dry season. A careful investigation showed that these analyses did not at all represent the quality of the water as it left the lakes, some 60 miles away from Bombay. Either multiplication in the pipes or dirty pipes, or pollution added en route, was the explanation of these figures.

Korthof (G.). **Onderzoek naar de bruikbaarheid van een Jewell-filter in de tropen ter reiniging van kali-water.** [Research on the Usefulness of a Jewell Filter in the Tropics for the Purification of River Water.]—*Geneesk. Tijdschr. v. Nederl. Indië.* 1922. Vol. 62. No. 3. pp. 359–362.

Many difficulties had to be met with before the plant was working well. The number of bacterial colonies dropped from 5,000 in the river water to 50 in the effluent. Eijkman's fermentation test was positive in 0·01 cc. of the river water, and in ½ cc. of the filtered water, in 10 cc. of which the presence of coli bacillus could be demonstrated. The author does not consider the Jewell filter to be an easy and trustworthy apparatus for this purpose. In Holland the Jewell filter is here and there in use as a preliminary filtering plant before the slow sand filtration of river water.*

* Summarized by Dr. W. J. Bais.

COLOMBO. **Municipality of Colombo. Reports of the Medical Officer of Health, City Analyst, and Municipal Bacteriologist for the Year 1921.** [PHILIP (W. Marshall), M.O.H.]—42 pp. With 6 maps, 4 figs. and 8 charts. 1921. Colombo, Ceylon: R. H. Cottle, Govt. Printer. [Price not stated.]

Research Reports. 1. *On the Cause and Prevention of the Loss of Carrying Power of the Colombo Water Mains* [by HIRST (L. F.), Municipal Bacteriologist]. pp. 35–39.

These reports from Colombo (which are some of the best we have ever received) contain a particularly interesting paper on the cause of the blocking up of the pipes in the water supply of Colombo, by Dr. L. F. HIRST. The matter has been under study for a considerable time. The conditions in Colombo are not unique, but are uncommon in the tropics; the water causes a deposit to form on the inside of the pipes which very greatly reduces their carrying capacity and is a source of endless worry and annoyance to the engineers in charge.

As is usually the case when this takes place there is iron present in the water. In Colombo this metal is present to a very considerable extent, but as pointed out by the writer it rapidly decreases in amount if the water is well oxidized, so much so that the water taken from the surface of the reservoir contains very much less than that at the bottom. Even with oxidization, 1·5 parts per million remain which is very difficult to remove.

The writer describes the method of incrustation of the pipes as follows:—

"It begins as a thin gelatinous coating of the whole interior surface of the pipe. It appears first at points where there is some obstruction to the flow of water, such as an angle or bend in the pipe line.

"The next stage is the formation of tubercles at various points, very similar in general appearance to those produced by the chemical action of certain waters on unprotected pipes. The microscopic examination of scrapings from the surface of these tubercles shows a network of living iron bacteria, with all kinds of small algae, crustacea, protozoa, and small oligochaetes entangled in the mesh.

"Beneath this is the harder reddish crust containing much iron, mainly in the form of ferric hydroxide, interlaced with the dead empty sheaths of *Leptothrix ochrea*. These sheaths are thickened with deposited iron; the empty shells of desmid are also common here.

"Next to the pipe wall is a blackish mass consisting of dead organic matter heavily impregnated with magnetic oxide and sulphides of iron. In the midst of this mass are barely recognizable debris of what are probably iron and sulphur bacteria.

"In the course of years the tubercles merge together and form a gradually thickening crust, lining the pipe with a very rough irregular surface. This roughness lessens the velocity of flow of water, thereby adding to the effect of the obstruction of the lumen of the pipe. The crust may occupy two-thirds of the diameter of a 3 in. pipe. The nett result is to enormously diminish the amount of water delivered to the consumer in a given time."

. . . . . .

"*Laboratory experiments on growth of iron bacteria.*—The researches carried out in this laboratory indicate that there are three factors principally concerned in the growth of iron bacteria in a water supply. The presence in the water of—

"1. Small quantities of iron in a state of solution or colloidal suspension.

"2. Oxidizable organic matter in small quantity.

"3. Iron bacteria.

"There appears to be no doubt that *Leptothrix ochrea* can grow without iron if manganese is present. There is no manganese in the Colombo water. I do not think it is yet established that *Leptothrix ochrea* will grow to any extent in the absence of either iron or its chemical ally, the metal manganese.

"Without iron the incrustation would not take a solid form.

"Nevertheless, filamentous bacteria do grow in the Colombo water, when only the merest trace of iron is present."

The writer points out that the treatment of the water for the purpose of preventing bacteria incrustation in Colombo combines, firstly, the removal of the bacteria present in the water, and, secondly, the destruction of the bacterial food dissolved in it. The first object can be obtained by filtration. In Colombo the Jewell filters are in reality too small to cope with the demand; consequently if the filtration gives an adequate supply it does not remove the bacteria. If, on the other hand, the filtration is done carefully, with proper bacterial reduction, the quantity is insufficient for the town.

To attain the first object obviously the filter plant should be entirely renovated and extended. As regards prevention of the growth of iron bacteria, several methods have been tried. Chlorine was found not to be satisfactory; liming the water, though it removes the iron, does not stop the growth of *Leptothrix ochrea*. Subsequently a coke filter was tried with very marked success.

"*Treatment of Colombo water supply.*—What is required for Colombo is a combination of the two methods, *i.e.*, a coke aeration and absorbing plant, followed by as efficient filtration as it is possible to obtain without the use of more than a very small amount of coagulant.

"The present number of filters cannot deal with any larger quantity of water than is already passing through them.

"One effect of the proposed oxidizing and absorbing plant would be to relieve the filters considerably at certain seasons of the year.

"Steps should be taken as soon as possible to provide either a floating arm or a series of additional valve openings so that the water in the straining shaft may be constantly drawn off at the most suitable level, which is about 2 ft. from the surface. This improvement will also relieve the filters. More filtering units will soon be required.

"It would probably be an advantage to include layers of the oxidizing minerals, such as oxidium or polarite, in the oxidizing and absorbing plant in addition to coke.

"There are two main types of apparatus which might be used.

"1. An aerating tower, containing successive trays of coke, etc., through which the water could be passed in thin streams by gravity, passing out from the bottom into the settling basin and thence to the filters.

"2. A tank containing submerged beds or screens of coke, etc. The water would require to be aerated by air under pressure in the neighbourhood of each bed or screen.

"Provision would be required in either case for washing each layer, bed, or screen, with a forcible stream of water at intervals depending on the amount of suspended matter and iron in the water under treatment. Probably once daily would suffice under average conditions at Labugama.

"Plant of either type is in operation in various parts of the world for oxidizing impurities in water or for removing excess of iron. Such plants can be constructed very cheaply and operated very economically."

GREENBURG (Leonard). **A Source of Lead Contamination of Cistern Water. Report of an Examination of the Drinking Water Supply System at the U.S. Fish Hatchery Station, Ten Pound Island, Gloucester, Mass., for Possible Sources of Lead Contamination.**— *Public Health Rep.* 1922. July 28. Vol. 37. No. 30. pp. 1825–1829.

An account of an outbreak of lead-poisoning in a Fish Hatchery, where, after careful investigation, it was found that rain water assisted by the action of the salt spray of the sea on the lead flashing of a stair leading on to a roof was responsible for the poisoning of the water.

STEWART (A. D.). **Note on the Relative Rate of Absorption of Solar Radiant Heat of Silt Laden Waters.**— *Indian Med. Gaz.* 1922. Aug. Vol. 57. No. 8. p. 289. With 7 charts.

An account of an investigation into the capacities of different waters to absorb heat from the sun's rays. It is shown that clear waters, irrespective of their saline contents up to 40 parts per 100,000, absorb radiant heat at the same rate, but that waters turbid with silt absorb more. The temperature was taken every five minutes, and the results are given in the accompanying charts.

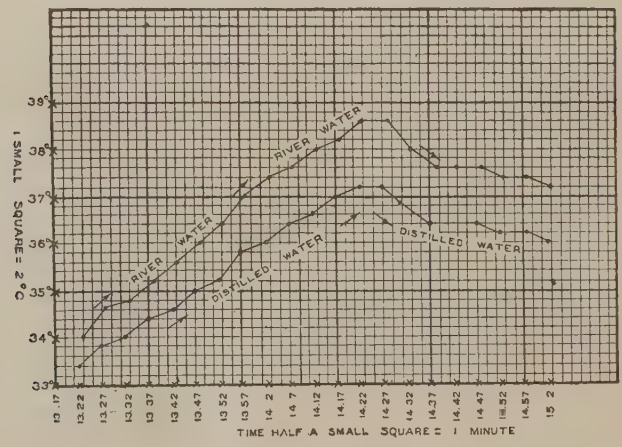


FIG. 18.—Comparison of rate of absorption of solar radiant heat of silt laden river water and distilled water.

[Reproduced from the *Indian Medical Gazette*.]

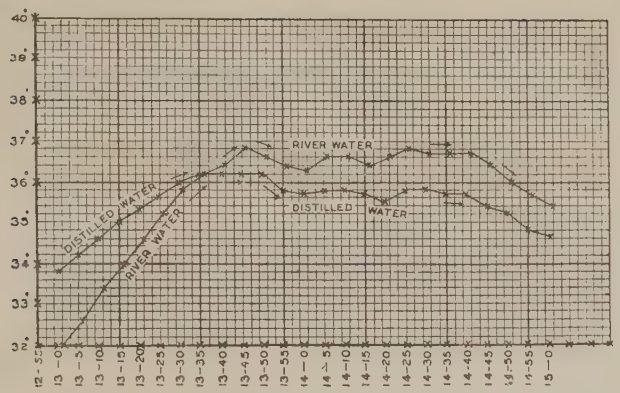


FIG. 19.—Comparison of rate of absorption of solar radiant heat of silt laden river water and distilled water.

[Reproduced from the *Indian Medical Gazette*.]

The writer, quoting HODGSON and KING's work, considers that this may have some adverse influence on the breeding of malarial mosquitoes—a rather doubtful contention.

SMALLPOX VACCINATION.

HEISER (Victor G.) & LEACH (Charles N.). **Vaccination in the Philippines still Effective.**—*Jl. Amer. Med. Assoc.* 1922. July 1. Vol. 79. No. 1. pp. 40–41.

—— & ——. **Vaccination in the Philippine Islands.**—*Jl. Trop. Med. & Hyg.* 1922. Oct. 2. Vol. 25. No. 19. pp. 306–307.

This article gives a very interesting account of the results of ordinary smallpox vaccination in the Philippine Islands, which, unfortunately, the anti-vaccinator is unlikely to see.

Apparently, prior to the Americans taking over health organization in the Philippines, these Islands were, like all other tropical countries, subject periodically to severe and violent epidemics of smallpox, with 40 or 50 thousand deaths. On the arrival of the Americans this was entirely changed, so that in the year 1914 in the city of Manila there had not been a single death from smallpox for seven years.

During the war the medical service was considerably depleted and the vaccination staff could not be looked after; consequently the work suffered and about the year 1918 a violent epidemic occurred; 50,000 deaths were actually reported from the whole of the Philippine Islands. This calamity has been used by the anti-vaccinators in the U.S. as a proof that vaccination was unsatisfactory.

As a matter of fact investigation shows that amongst the deaths 93 per cent. were among the unvaccinated, whilst only 7 per cent. of those who had been vaccinated earlier perished.

The writers point out that in parts of the Philippine Islands it is extremely difficult to arrange for the dispatch of lymph, the method of transit is very slow and the temperature high, so that it is frequently sterile before it arrives. This difficulty has now been overcome.

Joven (Pedro). **Vaccination versus Small-Pox.**—*Monthly Bull. Philippine Health Service.* 1922. June. Vol. 2. No. 6. pp. 177–182.

The writer gives an interesting account of the earlier outbreaks of smallpox in the Philippines and arrives at the conclusion "that vaccination has been beneficial to the Philippines at all times, because it has reduced remarkably the mortality from smallpox in the Province of Mindanao and Sula and caused its eradication in two different periods in Manila."

The figures in this and Dr. Heiser's article would be of use to those who may have to reply to anti-vaccinators.

Public Health Reports. 1922. Sept. 1. Vol. 37. No. 35. pp. 2108-2112.—**Smallpox Outbreak in Glasgow shows Efficacy of Vaccination.**

Conclusions.

"No vaccinated person in the Glasgow epidemic (1920–21) under 15 years died.

"At the ages 15–20 there were 62 cases vaccinated and only 2 deaths.

"The mortality among the vaccinated in infancy fell chiefly among those in the age groups from 35 years and over.

"On the other hand, the unvaccinated cases present a remarkable contrasting picture. No less than 112 cases out of a total of 128 were at the ages in the group 0–1–15 years. Of these, 38 died.

"An analysis of the 112 cases (unvaccinated) is useful. Under one year of age were included 16 cases. Of these the large proportion of 11 died.

"At ages 1–5 years, there were 32 children attacked. Of these 11 died.

"In the same group (112 cases of unvaccinated children) were 64 cases of ages 5–15 years; and of these 16 died.

"As Doctor Chalmers points out, the tables are well worth close examination and show the value of vaccination against both attack and death in earlier periods of life."

Janzen (J. W.) & Wolff (L. K.). **Over de reiniging der pokkenlymphe.** [On the Purification of Vaccine Pulp.]—*Nederl. Tijdschr. v. Geneesk.* 1922. Vol. 66. 1st Half. No. 23. pp. 2252–2254.

In 1917 Twort discovered the self-purifying property of the vaccine, which later appeared to be caused by a bacteriophage against staphylococcus (Bordet and Ciuca). The authors isolated this bacteriophage, the action of which, according to d'Herelle, is not much impaired by 50 per cent. glycerine. They tested the influence of glycerine and

that of glycerine together with the bacteriophage on cultures of staphylococcus isolated from the vaccine. Glycerine proved to have only an inhibiting action on the coccus, whereas it was destroyed slowly by the bacteriophage. Addition of a strong bacteriophage to the pulp may considerably hasten its purification.*

MITCHELL (J. A.). **Small-Pox and "Amaas" in South Africa.**—*Lancet.* 1922. Oct. 14. pp. 808–812.

The writer gives a very interesting description of the disease known as amaas in S. Africa. He points out that these mild attacks of smallpox, or "amaas," whichever opinion is held, were common in very early times, even prior to vaccination.

An epidemic in 1884 in Sutherland is referred to, where 100 consecutive cases occurred without a death. The author then gives an interesting account of how smallpox was brought into S. Africa; as usual, the disease was imported by ship, in 1713, from India.

The writer gives it as his considered opinion that amaas and alastrim, which is common in the Sudan and W. Indies, are in reality merely a mild form of smallpox, with low mortality, capable under unknown conditions of becoming virulent and greatly disfiguring the face; any disease which presents these characteristics can be nothing but discrete smallpox. With this opinion we entirely agree.

DISINFECTION.

FETEL. **Extrait d'une étude de la désinsectisation des casernements.**—*Arch. Méd. et Pharm. Milit.* 1922. Apr. Vol. 76. No. 4. pp. 484–494.

The writer deals with the disinfection of a bug-infested barrack, He tried four methods, namely, chloropicrine, clayton gas, "toccidant," and burning sulphur and describes the use of each.

Concerning the first we would refer the reader to RANDIER's article (San. Supp. No. 2. 1922. pp. 146). The writer slightly modifies the method by pouring the fluid quickly into a plate at each corner of the room. He considers this better than using a syringe. "Toccidant" is really nothing more or less than a patent method of burning sulphur in a stove; it reaches the fire in the form of a powder and one obtains very rapid conversion to SO_2 and SO_3. In the ordinary method of burning sulphur in the open it is found that better results are obtained by adding a certain amount of alcohol and mixing chlorate of potash or nitrate of soda; 4 gm. of chlorate of potash or nitrate to 50 or even 100 gm. of sulphur per cubic meter makes a satisfactory mixture.

His conclusions are that chloropicrine is probably the best method of killing the insects and their eggs, that fluids with petrol and kerosene oil are not so satisfactory, that clayton gas gives very good results, but the apparatus is rather cumbersome.

---

* Summarized by Dr. W. J. BAIS.

Brunet (F.) **Savons marins et parasiticides en hygiène coloniale et maritime.**—*Arch. Méd. et Pharm. Nav.* 1922. Sept.–Oct. Vol. 112. No. 5. pp. 414–421.

The writer discusses the properties of a satisfactory soap for use with salt water. It should be suitable as a bath soap as well as for washing clothes, furniture, and even the inside of ships' cabins; it should also kill lice and the eggs of other insects.

The best disinfectant to add to the soap is cyanide of mercury. The writer states that if 1 kilo of white soap is added to 20 gm. of cyanide of mercury, and the whole made into a thick fluid about the consistency of cream, it will kill pediculi both in the scalp and in clothes. This has also been found satisfactory for general purposes in patients suffering from venereal disease. Another good mixture is the following: 650 gm. of white soap is mixed into a paste with 25 cc. of water, and 100 gm. of yellow wax is added to 250 gm. of petroleum; careful mixing of these two solutions makes a very sound soap for killing parasites both in the skin and in clothing.

Public Health Reports. 1922. Nov. 3. Vol. 37. No. 44. pp. 2744–2747.—**Ship Fumigation. Preliminary Report of the Board appointed by the Surgeon General to investigate the Subject of Fumigation of Ships.**

The writer discusses the use of both sulphur-dioxide and hydrocyanic acid for fumigating ships. The advantages and disadvantages of these are thoroughly well known and need not be repeated, the main objection to HCN being that its highly poisonous nature has undoubtedly caused accidents. The writer therefore endeavoured to improve the technic of HCN disinfection and he consulted the Chemical Warfare Service of America.

Cyanogen chloride possesses nearly all the advantages of HCN and has in small quantities much the same effect as tear gas; its presence is therefore very easily detected by human beings. Several methods of generating cyanogen chloride are discussed. The formula given below produced the best results.

In the third series of experiments, sodium cyanide and sodium chlorate were added to hydrochloric acid with and without the addition of talc. The quantities giving the most satisfactory results per 1,000 cu. ft. were:—

4 oz. powdered sodium cyanide.
3 oz. sodium chlorate.
2 oz. talc.
17 fluid ounces commercial hydrochloric acid, sp. gr. 1·20.
34 oz. water.

Note.—This formula is tentative and may be changed later.

"First the talc was mixed with the sodium chlorate, then the cyanide was added and mixed and then the bag containing the mixture was dropped into the dilute acid.

"The composition of the lethal concentration as expressed in milligrams per litre is as follows:—

Cyanogen chloride	..	..	0·9407
Hydrocyanic acid gas	..	..	0·3269

"The purpose of the talc is to reduce the fire and explosive hazard. The friction and impact tests on the cyanide-chlorate talc mixture

carried on by the Bureau of Mines for the Public Health Service showed that the fire and explosive hazard of the mixture was very small except under extreme conditions not met with in actual usage.

" The cyanogen chloride and hydrochloric acid gas mixture given above fulfils the following requirements :—

" (1) Toxicity : High toxicity with rodents, bats, roaches, bed bugs. (The amount required for lice requires further experimentation.)

" (2) Detection properties : Intense lachrymation when lethal doses used. In $\frac{1}{8}$ lethal dose (having no harmful effect on rats after exposure of one hour) lachrymation was still extreme.

" (3) No effect on foods, tobacco, fabrics, leather, and no corrosive action on metals (with the possible exception of nickel).

" (4) Efficient penetration qualities.

" (5) Nonpersistence ; gas is not more persistent with hydrocyanic acid gas, probably less so.

" (6) Reasonably low cost per 1,000 cu. ft. Cyanogen chloride mixture $0,088 ; hydrochloric acid gas $0,081.

" (7) Fire and explosive hazards at minimum."

Jones (R. F.) & Richmond (P.). **A Simple Type of Portable Steam Disinfector.**—*U.S. Nav. Med. Bull.* 1922. Sept. Vol. 17. No. 3. pp. 529–536. With 5 figs and 4 diagrams.

The writers describe the method of use and some tests applied to the Lelean's sack disinfector—so well known to medical officers, particularly those employed in France, during the war.

The apparatus consists of a small copper boiler for heating the water, a portable kerosene blow lamp and a canvas sack in which the clothes are suspended for disinfection ; the figures [see p. 72] give the necessary details.

The tests applied by the writers show that coli bacteria, subtilis, and bed bugs are rapidly destroyed in aboat 15 mins. In addition, a raw egg placed among the clothing was, after 30 mins., pronounced to be hard boiled.

Piekema (R.). [**Les résultats de l'emploi des fours pour la désinsectisation à la station sanitaire d'Oldenzaal.**]—*Versl. en Mededeel. betr. de Volksgezondheid.* 1922. June. p. 420. [Summarized in *Bull. Office Internat. d'Hyg. Publique.* 1922. Aug. Vol. 14. No. 8. pp. 963–964.]

The writer gives a description of the new disinfecting station constructed by the Government of the Netherlands to deal with the clothing of emigrants proceeding to America. For insect disinfestation ordinary dry heat is used at a minimum temperature of 80° to 90° C. for 50 minutes ; for baggage a material known as " Cyclon " is used. " Cyclon " contains methyl cyanoformate 90 per cent. and methyl chloroformate 10 per cent. ; it is distributed from a specially constructed brass can fitted with a fine rose ; the fluid rapidly volatilizes forming hydrocyanic acid gas. The methyl chloroformate, acting as an irritant to the eyes and respiratory tract, gives warning of the presence of the poison.

FIG. 20.—"Sack" Disinfector (Essentials only) despatched to work in a kitchen.

FIG. 21.—Full Apparatus despatched t work in a dock shed.

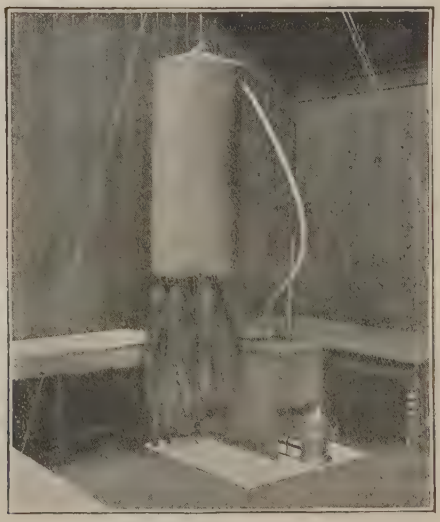


FIG. 22.—"Sack" Disinfector in use.

[Blocks for Figs. 20–22 were supplied by Messrs. Meldrums, Ltd., Timperley, Manchester. Manufacturers of the "Sack" Disinfector.]

INDUSTRIAL HYGIENE.

ROBERTSON (D. G.). **An Index to Health Hazards in Industry.**—*Commonwealth of Australia, Department of Health, Service Publication No.* 22. 54 pp.

The writer, who is Director, Division of Industrial Hygiene, in the Australian Commonwealth, has written an extremely interesting pamphlet on health hazards in industry. Naturally he deals with the subject entirely from the Australian point of view.

Practically all causes of risk have been dealt with including temperature, humidity, atmospheric pressure, dust and fumes, lighting requirements of factories, mills, etc., abnormal lighting conditions and many other aspects of the subject. There is also an alphabetical list of hazardous occupations and a table at the end of the work giving symptoms and occupations affected.

The work is of great practical utility to everybody interested in industrial hygiene.

LANZA (A. J.). **Industrial Hygiene and the Medical Profession.**—*Med. Jl. Australia.* 1922. Aug. 26. 9th Year. Vol. 2. No. 9. pp. 231–234.

The writer discusses the many advantages of having a properly constituted department of Industrial Hygiene, showing also its importance from the point of view of the business man who employs a large labour force.

Statistics derived from the Friendly Society of the Commonwealth in 1918, which possesses an average membership of 476,187, show that sick pay was drawn for 525,670 weeks, which averages 6·76 days per year per member. If this average is applied to the total working population it amounts to over 10 million working days per annum wasted.

In America, where industrial hygiene is much further advanced than in Australia or England, in one business concern ill-health has been reduced by 11·5 hours per annum per person employed, owing to the activities of the industrial hygienist.

BROUGHTON (G. M.). **Labour Records in Factories.**—*Jl. Industrial Hyg.* 1922. Oct. Vol. 4. No. 6. pp. 275–277.

This paper deals with the difficult subject of record keeping in factories in the East. It is quite unnecessary to point out the advantages of accurate record of labour in a business concern.

The writer gives several tables strongly redolent of a government of India secretariat, which she thinks it is desirable for mill-owners to fill in. We consider them largely superfluous; the same results could be obtained more easily by a proper system of card indexing.

The writer obviously has little conception of the real difficulties. She says that the mill managers object to her recommendations on the ground of expense. The reviewer, who has had a great deal to do with mill managers, has found them always ready to adopt improvements provided they see some tangible results. It is hardly surprising that these recommendations have not found very great favour:

the outstanding fact is that for the most part they are useless until the employer actually provides housing accommodation for his labour. Some of the most enlightened firms are already doing this with the consequence that the employees remain for many years and accurate statistics as well as improved conditions can be obtained. Until this fundamental improvement is adopted, all attempts to obtain accurate figures are likely to be time wasted since the labour of many concerns changes so rapidly.

REPORTS AND STATISTICS.

PANAMA CANAL. **Report of the Health Department of the Panama Canal for the Calendar Year 1921.** [FISHER (H. C.).]—125 pp. 1922. The Panama Canal Press: Mount Hope, C.Z.

Vital Statistics.

Employees.

"The average number of employees on the rolls of the Panama Canal and the Panama Railroad for the year was 15,389, as compared with 20,673 for 1920, and 24,204 for 1919.

"The total admission rates to hospitals and quarters was 620·33 as compared with 671·84 in 1920 and 550·21 for 1919. For disease alone the admission rate to hospitals was 180·35, as compared with 183·91 in 1920, and 176·09 in 1919. The total admission rate to hospitals only was 211·20, as compared with 221·35 in 1920, and 210·92 in 1919.

"The total death rate was 6·46, as compared with 8·70 in 1920, 7·23 in 1919, 8·11 in 1918, 7·09 in 1917, 6·03 in 1916, 5·77 in 1915, and 7·04 in 1914. The death rate from disease alone was 5·70, as compared with 7·40 in 1921, and 6·20 in 1919.

"The constantly non-effective rate from all causes was 13·96, as compared with 14·87 in 1920, and 14·29 in 1919.

"The admission rate for malaria, to both hospitals and quarter, was 14·94, as compared with 19·40 in 1920, and 31·07 in 1919. The non-effective rate for malaria was 0·33, as compared with 0·45 for 1920, and 0·99 for 1919.

"The admission rate for typhoid fever was 0·28, as compared with 0·24 for 1920, and 0·17 for 1919. One death from typhoid fever among employees occurred during the year.

	1920.		1921.	
	Admissions.	Rate.	Admissions.	Rate.
Venereal diseases	552	26·70	310	21·54
Malaria	401	19·40	216	15·01
Influenza	621	30·04	108	7·51
Diseases of the eyes and their annexa	152	7·35	104	7·23
Tuberculosis (various organs)	82	3·97	38	2·64

The five diseases causing the highest number of deaths with their rates were as follows :—

	1920.		1921.	
	Deaths.	Rate.	Deaths.	Rate.
Organic diseases of the heart ..	11	0·53	14	0·97
Tuberculosis (various organs) ..	30	1·45	11	0·76
Nephritis (acute and chronic) ..	13	·63	9	·63
Pneumonia (broncho and lobar) ..	22	1·06	7	·49
Cerebral hemorrhage apoplexy ..	6	·29	6	·42

"All rates are computed as equivalent annual per 1,000."

MASON (G. B.). **The British West Indies Medical Services.**—*United Empire.* 1922. Nov. Vol. 13. (New Series). No. 11. pp. 692–698.

The writer gives an extremely interesting paper on the population, density and amount of trade, revenue and the proportion spent on medical relief in the British West Indies.

We frequently review the annual reports of these colonies. Many of them, as the figures show, have very unsatisfactory health statistics and require large sums of money spending on them for remedial measures. It would appear that the problem of sanitation for the future is largely the provision of the necessary money for improvements. As regards this there are no two colonies that present the same difficulties.

A Comparative Statement of the Population, Total Revenue, the amount spent on Medical Services, the Birth rate, Death rate, and rate of Infantile Mortality of Bermuda, the British West Indies, British Guiana and British Honduras, compiled from the latest Blue Books, 1920–21. [*Abridged.*]

Colony.	Area in Square Miles.	Population Census, 1921.	Density = No. per Square Mile in 1921.	Total Revenue, 1920–21.	Per cent. of Revenue Spent on Medical Services.	Birth-rate.	Death-rate.	Rate of Infantile Mortality.
				£				
Bermuda	19·5	20,137	1,033	219,753	4·44	28·06	17·10	140
British Guiana ..	90,300	297,691	3·29	1,270,675	9·44	31·9	25·6	148
British Honduras ..	8,598	45,317	5·27	251,096	8·45	45·03	25	123·04
Bahamas	4,404	53,031	12·04	254,019	9·22	34·4	21·6	—
Jamaica	4,207	857,921	203·92	2,332,635	6·99	40·8	25·3	172·51
Turk's and Caicos ..	169	5,612	33·21	11,294				
Cayman Is. ..	89	5,253	59·6					
Trinidad	1,754	339,402	193·5	1,917,743	8·44	29·85	23·76	174·93
Tobago	114	23,378	205					
Barbados	166	156,312	941·64	454,284	9·82	29·68	26·44	270
Grenada	120	59,198	493·32	134,128	18·33	34·86	17·5	115
Carriacou	13	7,104	546·46					
St. Vincent ..	133	49,899	375·2	59,221	17·95	36·99	18·66	105
Grenadines.. ..	17	4,115	242					
St. Lucia	233	51,505	221	99,147	14·25	36·7	18·9	143
Dominica	305	37,059	121·5	59,219	12·52	41·12	27·62	146
Antigua	108	28,864	267·26	106,893	18·82	34·56	34·11	233·24
Barbuda	62	903	14·56	1,725	9·04			
Montserrat	32·5	12,120	373	19,622	10·10	41·14	23·24	133·93
St. Kitts	65	22,415	345	106,750	13·41	37·97	46·02	322
Nevis	50	11,569	231·38			40·92	36·82	173
Anguilla	35	4,230	121			51·90	25·36	43
Virgin Islands ..	58	5,082	87·62	11,715	6·74	—	—	—

[It must be remembered that these countries, varying so greatly in size and population as well as in their health problems, are not strictly comparable, and that the figures of the last three columns would not be claimed by their sponsors as accurate for the larger areas.—ED.]

Zauchinger (A.). **Demografía en la República durante el ano 1917. Memoria de la Seccion.**— *An. del Depart. Nac. Hig.* Buenos Aires. 1920. Jan.–Feb. Vol. 26. No. 1. pp. 13–37. With 5 charts and 6 maps in text.

——. **Demografía en la República durante el año 1919. Memorio de la Seccion Demográfica.**— *Ibid.* 1920. Nov. & Dec. Vol. 26. No. 6. pp. 391–415. With 7 maps and 4 charts.

The first of these papers deals almost entirely with vital statistics. The birth rate varied greatly in different provinces of the Argentine during the year under review, the total for the whole country working out at 33·7 per thousand.

The death rate for the same year was 15·8. One-third of the total deaths occurred among children under the age of two years, the chief causes being gastro-intestinal diseases in the summer, broncho-pulmonary affections and meningitis in the winter.

Tuberculosis accounts for a large number of deaths, namely 13 per cent. of the total. Records of deaths from this disease are given from 1911 which serve to point out that the total has increased by 50 per cent. since that time.

The second report is devoted to an account of the epidemic of Influenza which had shortly before spread through the country. It started in the latter part of October 1918 and returned again in the succeeding April, when, as has been noted elsewhere, it attacked with greater intensity those districts which had escaped the October ravages.

In June and July there were 3,498 and 3,488 deaths respectively, after which there was a steady decrease till in November and December there were only 273 and 202. The tables of the monthly mortality are very instructive as showing the rapid spread of the disease. In the year 1917 there was a total of 319 deaths ascribed to influenza; in 1918 there were 2,240, and in the following year 12,755. The chief manifestations, in the early cases at least, were pulmonary, so that many were diagnosed as pneumonia or broncho-pneumonia without specifying their influenzal origin.

Pulmonary tuberculosis was noticed frequently in connexion with influenza in the 1918 epidemic but not in that of the succeeding year, in which the tuberculosis curve is even lower than that of 1917. The author suggests that the less resistent phthisical subjects had been carried off by the first epidemic.

A curious fact is noted and illustrated by a map (No. XXII), that in 14 departments, seven of which were in the La Rioja province, there were no notifications of influenza, nor was there any increase in the mortality returns which might be regarded as undiagnosed influenza. No reason is suggested for this peculiar indemnity.*

Cortesi (Giuseppe). **La città di Tripoli dal punto di vista sanitario nel decennio 1912–1921.** [Sanitation in the Town of Tripoli 1912–1921.]— *Arch. Ital. di Sci. Med. Colon.* Tripoli. 1922. Mar.–Apr. Vol. 3. No. 3–4. pp. 46–66; May. Vol. 3. No. 5. pp. 89–99; June. Vol. 3. No. 6. pp. 118–131; July. Vol. 3. No. 7. pp. 142–154; Aug. Vol. 3. No. 8. pp. 174–187; Sept. Vol. 3. No. 9. pp. 197–215.

Before the Italians took charge at Tripoli, sanitation, judging from the first of these papers, was non-existent. With change of government filtration of water was instituted, a system of conservancy

* Summarized by Dr. H. H. Scott.

established, the civil hospital was renovated, a contagious diseases hospital erected, and so forth. The last census (for which, however, accuracy is not claimed) gave 10,000 Europeans (Italians, Maltese, Greeks, and a few English and French), 15,000 Jews, and 30,000 Arabs and Persians. Tables show the death-rates among the various races in different age groups month by month for each of the ten years dealt with, also the sex-mortality, omitting age groups. The greatest numbers of deaths occurred either between one and five years, or in the group 20–50 years, this last piece of information being of little value.

The other papers deal in greater detail with these figures. The high infantile mortality (36 per cent. under one year) is ascribed mainly to intestinal conditions from faulty feeding, and next to respiratory affections induced by a dusty atmosphere and overcrowding. Still-births are much the most numerous among the Arab population; this is ascribed to the secluded lives of the women in close, dark dwellings, and to the fact that medical aid is not summoned in times of difficulty.

Infective diseases have been less in evidence than would be expected from the mode of life of the people. Cases of *Small-pox* were few, and, fortunately, vaccination and revaccination are submitted to without reluctance. The death-rate from this disease never exceeded 1 per 1,000 of the population. *Measles* records are not reliable, but it is stated that only in one year did it assume an epidemic form, in 1917 when 327 cases occurred. *Diphtheria* again was never epidemic, the greatest number of cases in any one year being 20 in 1920; among these were six fatal cases, or 0·1 per cent. of the population; in no other year did it rise above half this rate. *Enteric fever* was reduced from 161 cases in 1912, before supervision of the water supply, to 66 in 1921. The majority of these last occurred in September, and the writer thinks that they arose from eating fruit from a suspected district in the interior. [There are, however, discrepancies in the figures for enteric which deprive them of their value.] *Tuberculosis* is on the increase, though not to the extent that figures would lead one to infer, as notification has only been enforced since 1914, and not strictly until even later; deaths have markedly diminished since anti-tuberculosis measures have been taken in hand, namely from 6·8 per 1,000 population in 1917 to 2 in 1921. *Typhus* assumed epidemic proportions in 1918, when there were 394 cases, whereas in the previous year there were only three, and in the subsequent years 6, 8, and 14 respectively. *Plague* at no time of the period under review became epidemic; the greatest annual number of cases was 43 in 1921, only one of which was pneumonic.

The existing sanitary service keeps constant supervision over the water supply, has officers for food inspection, a laboratory for diagnostic work, and a body of men for vaccination, disinfection, and other preventive measures. Prospective improvements are the establishment of a proper sewerage system, replacing of the present insanitary dwellings by houses of modern type, and a scheme for increasing the water supply which, though now of good quality, is insufficient.*

---

* Summarized by Dr. H. H. Scott.

Funaiolo (Giulio). **Nati-mortalità infantile nel villaggio arabo-beduino di Tripoli.** [Births and Infant Mortality in the Arab-Bedouin Quarter at Tripoli.]—*Arch. Ital. Sci. Med. Colon.* Tripoli. 1920. Jan. Vol. 1. No. 1. pp. 25–32.

The births and deaths records in the Arab-Bedouin quarter at Tripoli show a very disquieting situation. For the three years 1916, 1917 and 1918 respectively the total births were 43, 42 and 20, while the total deaths under five years were 49, 53 and 60, and the total deaths (at all ages) 92, 95 and 105. The heavy death-rate especially among children (in 1918 there were 27 deaths under one year compared with only 20 live births) is attributed to poverty and ignorance. The education of the population demands time and patience. It should be undertaken by child welfare dispensaries open to people of all religions and by allied institutions such as the French have established in their African colonies.*

Raynaud (L.). **Rapport sur l'état sanitaire de l'Algérie en 1921–1922.** —*Bull. Office Internat. d' Hyg. Publique.* 1922. Aug. Vol. 14. No. 8. pp. 930–937.

The writer gives an interesting account of the sanitary conditions in Algeria in the year 1921–2. The most important section concerns the very extensive outbreak of typhus fever and the measures adopted for its control. The disease is one of summer months and is usually at its worst in the month of May. There were 6,113 cases with 1,289 deaths between October 1920 and July 1921. In the same period for 1921–2 there were 1,106 cases with 173 deaths, a decrease largely due to the preventive measures taken.

Apparently the disease is nearly always spread by beggars who wander about the country passing from north to south along certain routes, and suffering considerably from want of food and hardships on the journey. Posts were established on main roads where the clothing was treated with sulphur and baths were given, with medical treatment where necessary. For this the assistance of the military authorities was given.

A series of about 30 sanitary posts was started along the line of the territory between north and south, where beggars and the agricultural labourers were properly treated.

The writer then gives a few brief notes on the other communicable diseases; these do not call for comment.

Heckenroth (D.). **Quelques renseignements démographiques sur Dakar.**—*Bull. Soc. Méd.-Chirurg. française de l'Ouest-Africain.* 1920. May. Vol. 2. No. 5. pp. 132–141.

Javelly (M.). **Renseignements démographiques sur Dakar en 1921.** —*Bull. Soc. Path. Exot.* 1922. July 12. Vol. 15. No. 7. pp. 667–671. With 1 chart in text.

The above articles give an interesting account of the vital statistics of the French town of Dakar, for the years 1920 and 1921.

In 1869 the population was 3,350; in 1920 it reached 25,000; in 40 years the population had multiplied by six.

The death-rate was approximately 34·2 per 1,000 in 1920; that of Europeans was only 13·3 per 1,000. It is doubtful whether the figures have resumed their normal level as a result of the violent epidemic of influenza in 1919, which gave a mortality of 35·9 per 1,000.

---

* Summarized by Dr. J. Rosslyn Earp.

The birth-rate is 26·7 per 1,000 amongst the native population. The figure for premature births is 12·8 for the years 1919–20, for the period 1909 to 1918 it was 15·5, and from 1899 to 1908 it was 17·1. Infant mortality, as in all tropical countries, is extremely high and calculated on the number of children born who die in the first four months it works out at something like 519 per 1,000; 23·5 per cent. of the children die within the first eight days, 15·8 per cent. in the first three months, but the mortality falls to 6·2 between the third and sixth months. The second year of life seems to be very fatal, 19·6 per cent. dying about that age.

The relation between the sexes at birth is 53 males and 46 females.

The author of the second paper points out that the most frequent cause of death in adults is epidemic disease particularly of the respiratory tract, such as pneumonia; intestinal diseases are also very common; marasmus is a very frequent cause of infant mortality; tuberculosis is becoming commoner. Plague also accounts for a large number of deaths within recent years.

Turner (L. J. B.). **Notes on the Population Statistics of Ceylon.**—*Jl. Ceylon Branch of the Brit. Med. Assoc.* 1922. Jan.–Apr. Vol. 19. Pt. 1. pp. 6–15.

The writer commences this interesting paper by pointing out that Ceylon possesses certain advantages for the study of vital statistics. In the first place it is not too small; having an area of 25,500 sq. miles and a population of 4½ millions, it is sufficiently large to avoid the errors of small communities, and the registration of births and deaths is reasonably accurate. Disadvantages are, the unreliable nature of the statistics concerning conjugal relations and also of course of the assigned causes of deaths outside the large towns.

The rate of increase of the population is :—1871–1881, 15 per cent.; 1881–1891, 9 per cent.; 1891–1901, 18·6 per cent.; 1901–1911, 15·2 per cent.; 1911–1921, 9·5 per cent.

The mean rate of 26 countries is given as 12 per cent, the highest being Canada with 34. Ceylon's present rate of 9·5 mean, would double the population in 76 years.

It will be observed that there has been recently a falling off in the rate of increase. This may be due to several causes :—

1. A possible error in the census figures of past years. This, however, is not likely to be very largely operative.
2. A trade depression and rice shortage owing to war conditions.
3. The influenza epidemic of 1918–1919.

Owing to the last cause the mean death-rate rose from 28·8 to 30·6 per mille and the excess of immigration over emigration fell from 176,000 to 93,000.

The crude birth and death-rate is as follows :—

Year.	Births.	Deaths.
1911	37·9	34·7
1912	33·2	32·3
1913	38·5	28·4
1914	38·1	32·2
1915	37·0	25·2
1916	39·0	26·8
1917	40·1	24·7
1918	39·2	31·9
1919	34·2	35·6
1920	36·5	29·6

The high infant mortality, in the neighbourhood of 200 per 1,000, influences the death-rate considerably; thus if the infant mortality rate was halved (reduced to 100) the death-rate would be 26 per mille, which, however, is still high. The high birth-rate is due to universal and early marriage of females. The expectation of life for a child is only 35 years as against 46 to 50 in England and Wales.

The influenza epidemic of 1918–1919 gave a death-rate of 13·4 per mille of the population and caused 57,000 deaths in all. This figure is a rough one owing to doubtful diagnosis, but it is certainly not far from the truth.

The fever rate for the island appears to be about 5·76 per mille or about one-fifth of the total average deaths.

The main cause of the increase of the population of the island is the importation of coolie labour for the tea estates. In times of trade prosperity the numbers are very large; in times of slump an excess of emigration over immigration is observed, as in 1917–18–19 and 1920.

In Colombo the death-rate is always in excess of the birth rate for several reasons. There is an excess of deaths of immigrants in jails and hospitals in the towns and women frequently leave for their homes in the villages for the birth of their children. The floating population in the town is, however, very large and is of course dependent on industrial prosperity.

Ceylon is exceptional in the ratio of males to the total population, which is the second highest in the world, being 529 per 1,000. There are, therefore, 264,000 excess males in Ceylon or 5·8 per cent. of the total population. In England the excess women number 1,700,000, or 4·8 per cent. of the total. The cause of this state of affairs is obscure; it is not due to faulty enumeration of the females and only to a small extent to the immigration. The masculinity at birth is about the same as in England. The female death-rate is, however, higher than the male at nearly all ages. In an unhealthy year the difference is somewhat reduced particularly in the age group from 15 to 20, as was the case during the pandemic of influenza in 1918 to 1919. The actual cause of this high death-rate amongst women is not ascertained.

WHIPPLE (George C.) & HAMBLEN (A. D.). **The Use of Semi-Logarithmic Paper in Plotting Death Rates.**—*Public Health Rep.* 1922. Aug. 18. Vol. 37. No. 33. pp. 1981–1990. With 16 charts in text.

The writer points out the many advantages of using semi-logarithmic paper for plotting vital statistics. The semi-log paper has a vertical scale based on the logarithms of numbers from 1 to 10, with subdivisions, and these repeat themselves, the distances between 1 and 10, 10 and 100, 100 and 1,000 being equal. The peculiarity of this combination of scales is that plotted data which have a constant rate of change produce a straight line. Money growing at compound interest, population growing at a geometrical rate, produce straight lines, and if plotted death-rates yield a straight line sloping downward it indicates that the rate of decrease is constant. It is especially useful for long-time records. When falling death rates produce a curve, as they often do on ordinary cross-section paper, it is difficult for the eye to detect differences in curvature, but when the plotted points fall upon a straight line for a time and the line changes abruptly in direction, one may more easily detect the time when the change began. A change in the direction of the line means that the rate of change has altered.

The article is illustrated with many charts showing the use of this paper. We publish two of these.

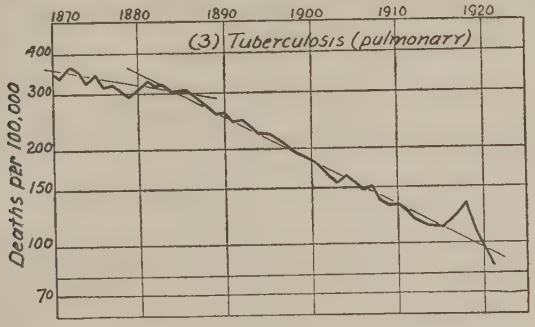


FIG. 23.—Tuberculosis death rates for Massachusetts (1870–1921) plotted on semi-logarithmic paper. Note change in rate in 1885 and steady fall since, except for influenza years.

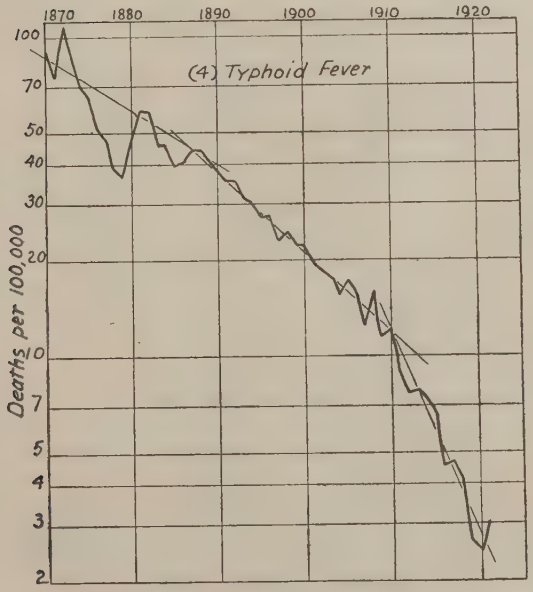


FIG. 24.—Typhoid Fever death rates for Massuchusetts (1870–1921) plotted on semi-logarithmic paper. Note break about 1880–1890 when activities of State Board of Health in study of water purification and sewage treatment were at their height, and second break about 1910 when pasteurization of milk was extensively adopted.

[Reproduced from *Public Health Reports.*]

MISCELLANEOUS.

Williams (G. Bransby). **Recent Progress in Sanitary Engineering in Bengal.**—*Surveyor, and Municipal and County Engineer.* 1922. Aug. 25, Sept. 1, and Sept. 8. Vol. 62. Nos. 1597, 1598, and 1599. pp. 119–121; 133–135; and 149–151. With 4 text figs.

This is an extremely interesting but somewhat lengthy article. It gives an accurate survey of the work done during the years the writer held office as, originally, Sanitary Engineer of Bengal and now as Chief Engineer with the Public Health Department of that Province. It describes the improvement that has been brought about in the city of Calcutta, and gives an interesting comparison between the rateable value of Indian towns and those of England.

"The rateable value of Bengal towns is low compared to English towns. Dacca has a rateable value of about Rs. 15 per head; Howrah has a rateable value of less than Rs. 20 per head; Chittagong has a population of 29,000 and a rateable value of Rs. 25 per head; while Darjeeling, with its large proportion of Europeans among its 20,000 inhabitants, has a rateable value of Rs. 44 per head."

The writer also deals with the water supply, and gives an account of the difficulties of financing schemes for its improvement.

"The position of an average Bengal town, faced with a demand for a public water supply, may be illustrated by the following example. Assume the town has a population of 25,000 and a rateable value of Rs. 500,000. Under the existing Municipal Act the maximum water rate leviable is limited to 7½ per cent. in the case of houses in a street in which a water main has been laid and 6 per cent. in streets not containing a main. Outside a radius from a standpost, which may be fixed by the local government for each town, no water rate can be levied at all. Under these circumstances the maximum income that may be anticipated from water rates may be assumed in the example taken to be about 6½ per cent.; 6½ per cent. of Rs. 500,000. is Rs. 32,500. The capital cost of a scheme which includes pumping and filtration, as the majority of the schemes in Lower Bengal do, may be taken at the present time as between Rs. 1,500 and Rs. 2,000 per 1,000 gallons supplied. The average working costs vary in such schemes from 1½ annas to 7 annas per 1,000 gallons. A reasonable figure for capital cost and working charges may be taken at Rs. 1,750 and 3 annas per 1,000 gallons.

"Under ordinary circumstances it has of recent years been customary for Government to give a grant of one-third the cost of schemes of this kind, leaving two-thirds of the cost to be paid for by the municipality. Loans for public works are given by Government to local bodies at a small percentage above the market rate for Government loans. The loan charges have much increased of late, but it may be hoped that the increase will not be permanent. For the purpose of this example it may be assumed that the interest on and amount of sinking fund for amortising the loan are 6½ per cent., which, however, is a good deal below the current rate.

"On this basis the largest waterworks scheme that could be financed from the water rates would be one to give 225,000 gallons per day. In round figures the annual charges in respect of such a scheme would be:—

Interest and repayment of capital of two-thirds of 393,000 equals 262,000 at 6½ per cent. equals	Rs. 17,000
Working costs for delivery of 225,000 galls. per day at 3 annas per 1,000 galls.	Rs. 15,500

"225,000 gallons per day for 25,000 persons is nine gallons per head. Generally speaking a water supply of about ten gallons per head per day is the utmost that can be afforded by any Bengal mofussil town when two-thirds of the capital charges and all the working expenses have to be defrayed from the water rates."

There are a large number of towns in Bengal which do not have even five gallons per head of the population. Although this may not be looked upon as adequate it has a very great effect on the health of the populace. There is nearly always the alternative supply for bathing and for washing of clothes, and a few gallons per head for drinking purposes is an inestimable boon.

The writer points out that the native of India has no idea of economy in the use of water when he is in possession of a private connection to the town supply. A very large number of schemes have been spoilt by the indiscriminate giving of house connexions. Some interesting details of the water schemes in Bengal are, unfortunately, too long for description here.

On the subject of drainage some interesting facts are given, and the more extended use of sewage systems is urged. Even if house connexions cannot be used, a simple arterial system of drains greatly improves the sanitation of a town. We give a picture of an automatic gulley separator which is to exclude storm water from the drainage system in heavy rain.

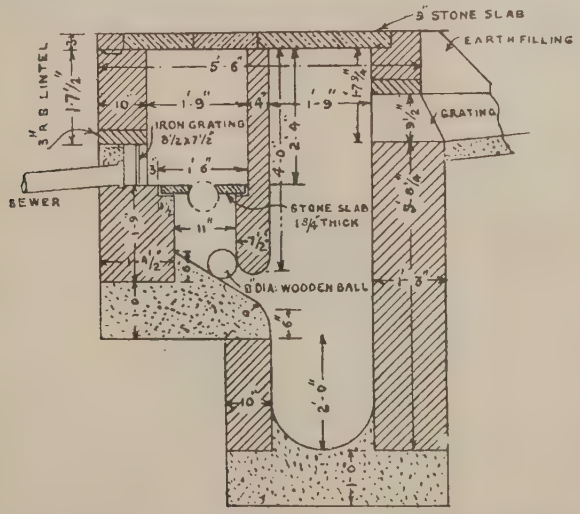


FIG. 25.—Dacca Sewerage: Section of Automatic Gully Separator for diverting excess storm water to open surface drains.

[Reproduced from *The Surveyor*.]

On the subject of anti-malarial drainage the author says:—"Of recent years several drainage schemes of a special character have been carried out in malarious places for the purpose of reducing this disease. These schemes may be divided into two classes: (1) Works which aim at regulating the level of water on land liable to inundation or partial inundation so as to reduce as far as possible the opportunities

for the malarial mosquito to breed, and (2) works which aim at getting rid of marshes and streams, in which mosquitos breed, altogether by draining them and putting them underground or else by training them and increasing their velocity, making it impossible for the mosquito larvae to exist in them.

"The former class of project is the only one suitable for malarious places in the delta area. The objects of the flooding schemes are (*a*) to reduce the water edge (which is the place where the mosquitoes breed under the protection of the grass and weeds which grow there) of the small pools by joining them up into large bodies of water; (*b*) to substitute silty water in which anopheles mosquitoes do not breed for clear water in which they do; (*c*) to silt up small hollows that can be got rid of in this fashion; (*d*) to maintain the water level in the inundated area at the best level for the achievement of these objects, and also so far as possible so as to suit the rice crops wherever they are being grown; (*e*) to arrange for the rapid and complete discharge of the water on the land at the end of the rains when the floods in the rivers have subsided. The methods by which these objects are attained are simple, and consist of sluices at the inlet and outlets to and from the controlled area, with the necessary drains and channels.

"Schemes of class (*b*) are suitable for the undulating country lying to the north of the province close to the foothills of the Himalayas and also in some places in the west of the province such as the coal-fields."

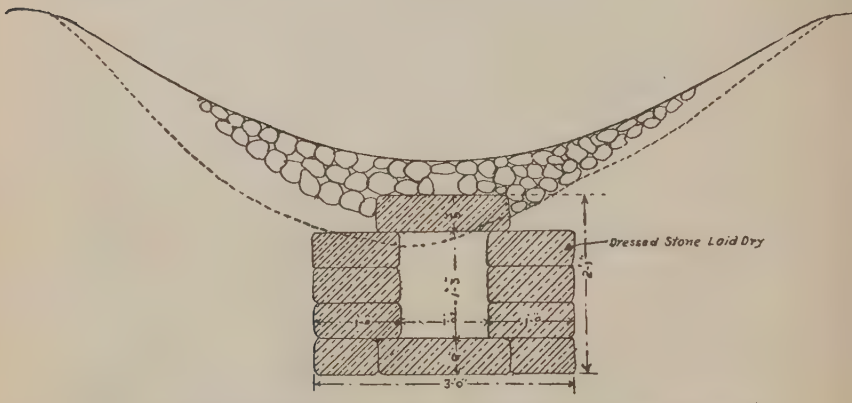


Fig. 26.—Anti-Malarial Drainage: Cross Section of main channel.
[Reproduced from *The Surveyor*.]

Indian Engineering. 1922. Nov. 4. Vol. 72. No. 19. p. 298. With 2 plans.—**Cheap Temporary Quarters for Staff and Workmen employed on Construction of New Chitravati Bridge, Madras Railway.**

Not infrequently cheap temporary quarters are required in hot countries for staff. We publish three sets of plans of quarters for driver and lascar staff who were employed in building the Chitravati Bridge, Madras Railway in 1888–90. As semi-permanent buildings these are fairly satisfactory provided the blocks are spread out rather more than is shown in the plan.

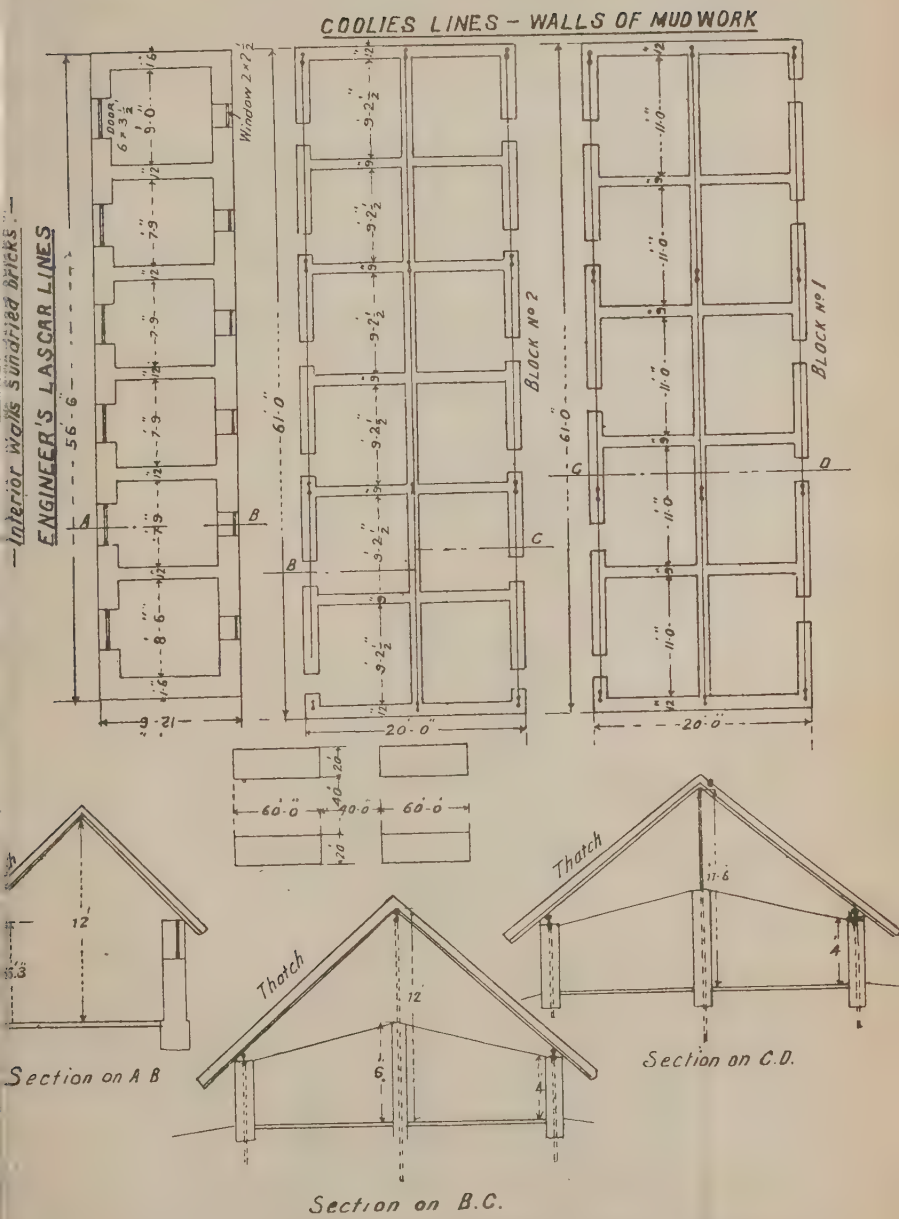
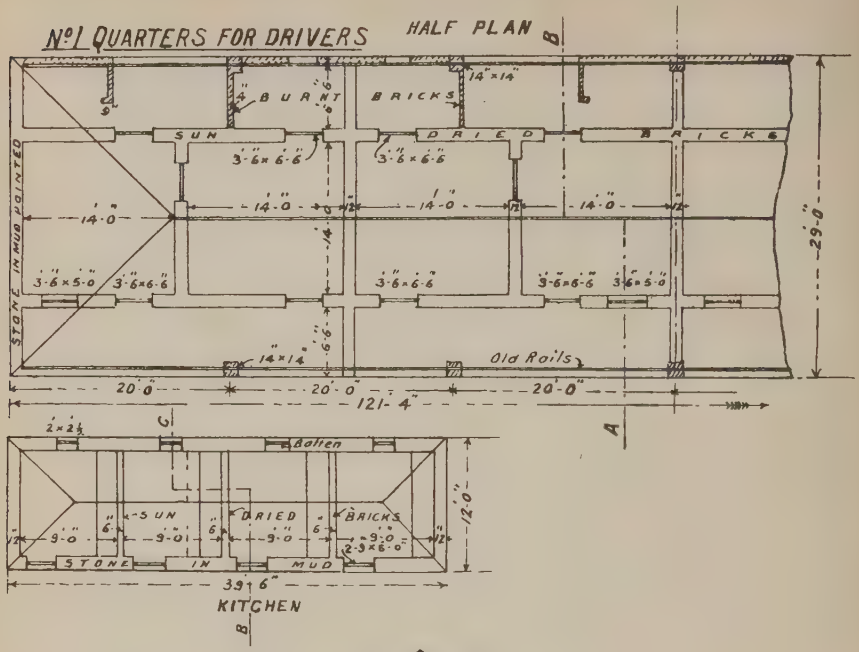


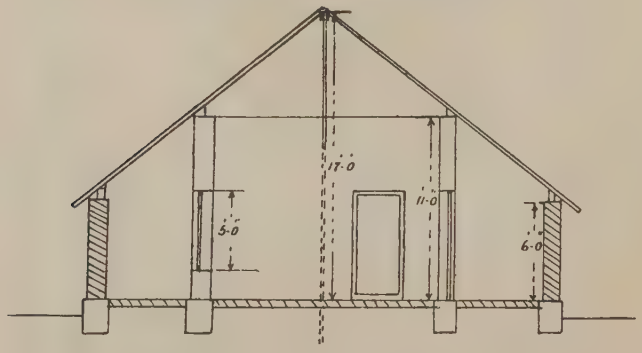
FIG. 27.—Temporary Quarters built for the Staff and Workmen employed on the construction of the Chitravati Bridge, Madras Railway.

[Reproduced from *Indian Engineering*.]

FIG. 28.—Temporary Quarters built for the Staff and Workmen employed on the construction of the Chitravati Bridge, Madras Railway.



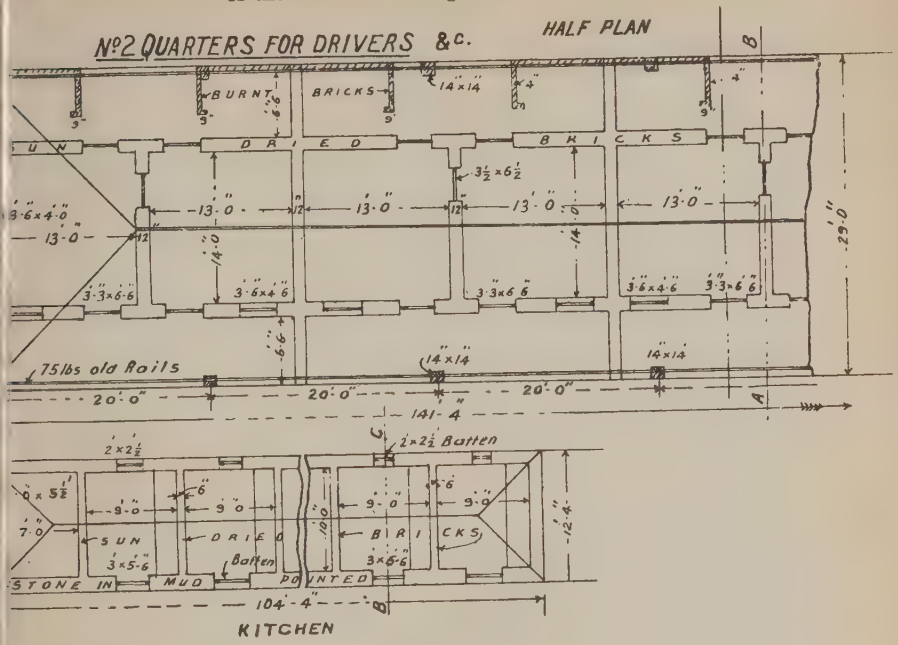
Roof Tiled Rafters bamboos 2 ft. apart from C to C.
Cost Rs. 170–5–10. P.F. 0–5–9.

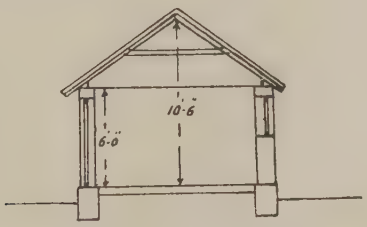


Section on A.B

Roof thatch supported by rails on side walls and on butt brick pillars 14 in. square. Rafters bamboos 3 in. round and 3 ft. apart from C to C. Doors and windows batten. Railridge supported by Rail pillars in Cross walls.
Total cost Rs. 1019–10–9. P.F. 0–4–8.
[Reproduced from *Indian Engineering*.]

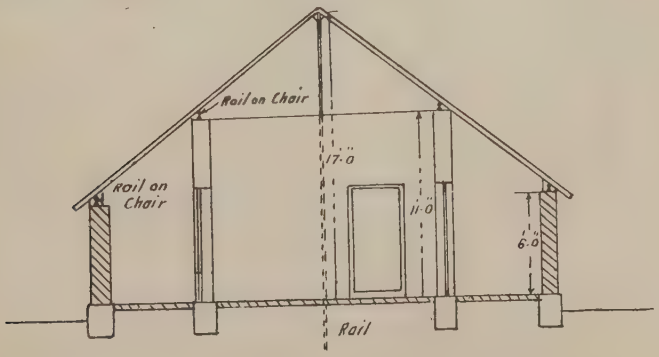
29.—Temporary Quarters built for the Staff and Workmen employed on the construction of the Chitravati Bridge, Madras Railway.





Section on B.C.

Roof Tiled Rafters 2 ft. from C to C. Cost Rs. 397–12–9. P.F. 0–4–11.



Section on A.B.

Roof thatch supported by railridge on rail. Pillars in cross walls, rails on side walls and on Brick pillars, 14 in. square. Rafters bamboos 2½ ft. from C to C. Doors and windows batten. Total cost Rs. 1056–6–1. P.F. 0–4–11.

[Reproduced from *Indian Engineering*.]

MUSGRAVE (J. L.). **Heating and Ventilation of Passenger Ships.**—*Lancet.* 1922. Oct. 14. pp. 840–841.

The writer gives an interesting account of that extremely difficult subject, the heating and ventilation of ships. He points out the difficulties of the problem, and lays stress on the fact that the various departments in the construction of a ship are always anxious to make their own arrangements satisfactory, often to the detriment of others.

He describes the thermo tank devised by Mr. A. STEWART of Glasgow which has revolutionized the heating and ventilation of ships. This is an arrangement of a steam-heated tank in conjunction with a fan. By the system of valves the amount of air that is passed through the heater varies so that the temperature of the air thrown into the cabin can be regulated. The apparatus is now used by the Board of Trade for third class passengers' and crews' accommodation.

BAERMANN (G.). **Het Colonisatie-Huis.** [Suggestions for Coolie Garden Cities.]—1919. Oct. pp. 13. Het Serdang Doctor Fonds.

Since the "contract" coolie system is expected shortly to be abolished and to be replaced again by that of "free" coolies, the author warns against the dangers which this latter system would bring with it from the hygienic point of view, unless timely measures were taken. As no control and supervision would be possible if the houses were allowed to be built anywhere and everywhere on the estate, he puts in a plea for the building of systematic, hygienic and attractive coolie garden cities, with good water supply, plenty of fresh air, and hygienic latrines.

Another important factor is the stability of the coolie population, as a fluctuating one is naturally a great danger from the hygienic point of view. To eliminate this serious danger the author advises the making of the garden cities as attractive and as close an imitation of the villages at home, as possible. Especially with the Javanese coolies is this of paramount importance, as they have a great love for their homes and villages. In addition, the author suggests that in each garden coconut palms and fruit trees should be planted, which, after a certain number of years, should become the private property of the coolies which they would be loath to leave.*

---

* Summarized by DR. Th. JOEKES.

REVIEWS.

HARDENBURG (W. E.). **Mosquito Eradication.** First Edition. pp. ix + 248. With 146 figs. 1922. New York & London: McGraw-Hill Book Company. [Price 15s.]

This is a very good book, but it is compiled too exclusively from American experience to be of general use outside America, although some good general ideas of the scope and methods of sanitary engineering in mosquito control can, no doubt be obtained from it. In America, however, it should be well appreciated.

In the author's view "it is a comparatively simple matter to eradicate Anopheles mosquitoes . . . . but when it comes to eliminating breeding of house mosquitoes the director of the campaign has a man's job on his hands." This hardly corresponds with the general experience of the medical services in the tropics.

There are some excellent prolegomena on the initiation of an anti-mosquito campaign,—the practical points to be attended to in the preliminary survey of the field, and in the subsequent formulation of a policy and preparation of plans of work, and estimates of personnel, equipment, and expense. There are some equally sound remarks on the practical details of administration—reports, records, mapping, routine inspection, etc.

The chapters on drainage are good. As the author remarks, the premier advantage of drainage is that incidentally it brings waste land under cultivation; but, as he adds, there is not much point in draining a single pond that can be stocked with fish at little expense. The author discusses inland drainage and salt-marsh drainage as separate questions, since in draining extensive tracts of salt marsh it is sufficient to get the surface water concentrated in channels.

In dealing with inland drainage the usual subjects of open ditching, subsoil drainage, vertical drainage, channelling of streams, and filling are discussed seriatim. The details of planning ditches, and of their construction by hand, by blasting, and by machines of various kinds are described and exemplified with reference to different soils and local circumstances, as also are ways of keeping the course and sides of open ditches clear and clean. Practical details of subsoil drainage, vertical drainage, and channelling streams are dealt with in the same way, and the important questions of labour and cost are never forgotten. In treating the subject of salt-marsh drainage different plans and methods of ditching, construction of dykes, sluice-boxes and tide-gates are considered, as well as certain alternative questions of filling or pumping. The text in all these sections on drainage is well illustrated by figures.

The author gives the usual curriculum on oil and other larvicides and the different apparatus for spreading them—sprayers, drip-cans, swabs, sawdust, etc. All that he adds from his own experience is that as a method of finality oiling is mostly applicable to small pools filled by rain when they are too numerous to drain and too transitory to maintain fish. These are just the places that in tropical countries one would like to see dealt with, as they were long ago on the Calcutta *maidan*, by an engineer.

A good deal is said about control of mosquitoes by fishes, and a goodly number of Cyprinodonts are figured. According to the author control of this sort," where it is applicable, is one of the cheapest and most satisfactory methods of fighting the mosquito," not only in fountains, cisterns, wells, small ponds, pits, etc., where there is no water-weed, but also in lakes and streams. In places of the last kind, however, the fish must be helped by removal of aquatic vegetation, and this leads the author on to methods of killing or removing such vegetation.

The opening chapters, besides containing brief descriptions and good figures of some American mosquitoes, give a general account of the life-history and anatomy of the typical mosquito, of the generic differences of Anopheles, and of the relations of the mosquito to diseases of man. This account though not free from errors of detail, imparts clear and correct impressions.

A. Alcock.

TURNER (J. A.), [C.I.E., M.D., D.P.H., Late Executive Health Officer, Bombay Municipality] & GOLDSMITH (B. K.) [M.B., D.P.H.]. **Sanitation in India.** With Contributions by HORMUSJI (S. C.), SHROFF (K. B.) & GODINHO (L.).—pp. xiv + 1133. With plans, charts and illustrations. Demy 8vo. 3rd Edition. 1922. Bombay : The Times of India. [Price 25s.]

After having carefully read this book and taken notes of various points, it was interesting to turn to the review of the first edition (published in 1914) contained in this *Bulletin*, Vol. 4, page 233, and written over the initials " W. G. K."

In very many respects this old review stands good, for one finds the same points for criticism in the third edition that were noted in the review of the first. There is still a marked amount of duplication of information and it appears that revisions subsequent to the publication of the first edition have been quite inadequate in this and in other respects. This is all the more surprising as the preface to the second edition dated 1st February 1917, contains the following words " Some valuable suggestions contained in the reviews which appeared on the publication of the book have been adopted."

It will therefore be unnecessary to mention again the various points adversely criticised in the review of the first edition, very many of which are still retained in the new. An attempt will accordingly be made to deal with some other matters in the present edition.

On page 233 a " Glossary of Technical Terms " is given which includes such words as " bacteria," " septic," " urban," " siphon," " sludge," etc. It is hardly conceivable that any medical man or sanitary inspector, who had progressed sufficiently far in his studies as to read a book of this magnitude, would not know what practically every word in the Glossary means. On the other hand the opening chapter of the book, which deals with the Administration of Public Health Acts in India, contains many words such as, for example, " Karkoons," " Mukadams," " Ramosis," " Patels," " Bigaries," etc., which a student without Indian experience may be at a loss to understand. Indeed, many of the local terms used cannot be found in a good Hindustani dictionary. This chapter would be more readily understood by the reader lacking Indian knowledge if a glossary had been included.

Chapter VI. which deals with Infectious Diseases and their Prevention is not very evenly balanced. Yellow Fever occupies over 20 pages and Trypanosomiasis of Man six, and yet neither have so far appeared in India ·

moreover there is now very little risk of the former reaching that country. On the other hand Leishmaniasis and Oriental Sore, both diseases of considerable importance in India, are dealt with in one page. Furthermore in this page the following erroneous statements occur: (*a*) in discussion of the mode of transmission of Leishmaniasis it is written " This has not been definitely ascertained, but there is evidence that the dog is the principal reservoir of the disease "; (*b*) under Oriental Sore it is said " *Cemex* (sic) *rotundatus*, the bug is the transmitter of the disease in India." As regards the etiology of Yellow Fever it is stated on page 598: " The cause is unknown other than the fact that it is a filterable virus (Chamberland, F.) " and this is repeated on page 608. In the six pages devoted to the description of Sleeping Sickness, the only reference to the Rhodesian form of the disease occurs on page 654 and consists of " Another variety of trypanosome (*T. rhodesiense*) has also been found to be transmitted by *Glossina morsitans*." On page 461 Typhus fever is classified as an intestinal disease. Beriberi is regarded as infectious and intestinal, and a good deal of space is occupied in discussing theories as to its cause which are nowadays out of date.

Undulant fever, as regards prophylaxis, is dealt with solely by the words " Malta and those Mediterranean ports in which the fever is endemic should be avoided during summer," a useful bit of advice for anyone stationed there!

As might be expected, the article on plague is full of useful information, but under Rat Destruction one would have wished to see the pros and cons in the case of hydrocyanic acid gas more adequately dealt with. This is surprising in view of Glen Liston's work, much of which was carried out in Bombay or in its immediate vicinity.

The articles on Cholera and Tuberculosis contain good and useful material, but one fails to learn anything on the value of the Schick test or of toxin-antitoxin for immunization in dealing with Diphtheria.

On the subject of Disposal of Waste, much information is given and the chapter on Water is of value, especially from the tropical aspect, based as it is on the work of Clemesha. One fears that the recommendation on page 300 to sterilize candle pattern filters in a Bunsen burner would generally result in much breakage.

Chapter IX. dealing with Dangerous, Offensive and other Trades is helpful especially in connexion with those commercial undertakings peculiar to eastern conditions.

Taking the book as a whole there is unquestionably a great mass of information contained within its covers, but unfortunately many of the statements made are incorrect or not up-to-date, and material of importance is omitted. There is undoubtedly room for a work on Tropical Hygiene which will deal completely and authoritatively with the numerous points so constantly arising; a book in short which may be regarded as a standard work of reference on this subject. One can only say with regret that this work, even as regards India, does not fill the bill, though without doubt it will be found of use to the reader who has already sufficient knowledge to supplement or correct as occasion requires.

A word should be said as regards the printing. The type used is clear and large enough for comfortable reading, but misplaced letters are very frequent and the spacing is often defective; faults that should have been remedied to a large extent in the proof-reading. The numerous illustrations are frequently instructive, but the execution of the work has been poor, with the result that the value, as illustrations, has been seriously impaired. In comparison with the first edition, there is a distinct falling off in the art of the printer.

G. E. F. Stammers.

EGYPT (Ministry of the Interior). Department of Public Health. **Infectious Diseases Handbook.**—142 pp. 1922. Cairo: Govt. Press. [Price P. T. 10.]

This is at once a concise manual and a code for medical officers of the Egyptian Public Health Department and appears to be a valuable compilation, marvellously free from obscurity and circumlocution. The first half gives sound advice as well as explicit instruction under the following heads:—Discovery and investigation of outbreaks, procedures for securing laboratory diagnosis, arrangements for isolation, treatment of contacts, management of the apparatus of disinfection, and propaganda; the second half deals in the same methodical way with particular diseases.

A. Alcock.